Railway Age Gazette

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For An Arbitration of Both Sides

The executive committee of the Chicago Association of Commerce has adopted resolutions regarding the controversy between the railroads and their train service employees in which it is declared that "arbitrary action on the part of either side without the disputed questions arising from the demands of *both sides* being submitted to a careful and impartial investigation, would be inimical to the public." The Chamber of Commerce of the United States and other organizations of business men have passed resolutions advocating arbitration, and the press of the country has been practically unanimous in insisting that the controversy shall be so adjusted, but the Chicago association goes a step farther by defining just what constitutes real arbitration. It says that "*both parties* to the controversy should submit *their* differences to an impartial board of arbitration for the adjustment of *all causes of difference* between them with due regard to the interests of the public." (The italics are ours.) Arbitrations of railway wage disputes in the past have not complied with these specifications. They have always been confined to the demands made by one side—that of the employees—and have usually resulted in compromises as to how much they should receive. The railroads have always been on the defensive. No matter what the award was it was invariably at the expense of the railroads. The Chicago Association of Commerce Committee apparently had in mind the controversy between the western railroads and their engineers and firemen in 1914, when the brotherhoods presented certain demands for large increases in wages and the railroads in turn presented certain counter-demands upon the employees as the basis of a compromise. The employees refused to arbitrate anything but their own demands, and the railroads, having been placed before the public in the position of refusing arbitration, at the demand of President Wilson, were obliged to submit to a one-sided proceeding in which they had nothing to gain and everything to lose, in order to save the country from the disastrous effects of a strike. If it is fair to have arbitrated the demands of the employees of the railroads for higher wages it is equally fair to have taken into consideration some of the demands of the railroads regarding the service to be rendered for the money.

Committee on Freight Congestion

The presidents of the eastern railroads in personally tackling the freight congestion problem and in getting members of the Interstate Commerce Commission to join them in dealing with local difficulties at short range have taken the logical course; the problem is of unexampled magnitude and difficulty and it demands the attention of the highest officers of each road. An account of the action taken is printed on another page. Many important lines of business are suffering severely from delays in transportation, and each carrier, in dealing with aggrieved shippers, naturally finds it desirable to speak through an officer exercising plenary authority. As to actual things to be done, the new executive committee of six presidents can make but little change in what was already being done by the committee formed at New York City November 30; the prompt and fair imposition of embargoes and the use of every possible pressure to get cars unloaded. The presidents, however, will, no doubt, be able to accomplish more thorough and effective co-operation between the different roads. This alone is a feature of constant importance for each separate embargo is a problem in itself. The presence of Commissioner E. E. Clark, sitting with the presidents, should reassure the suspicious among shippers, and the intimate knowledge of details which Mr. Clark will gain ought to bring prompt approval by the commission of the advance in demurrage rates which the railroads have proposed and which the National Industrial Traffic League has agreed to. (See March 17, page 517.) A demurrage charge more commensurate with the value of a car and of the yard room that it occupies is demanded at this time by every consideration of equity, and the fact that it has taken three months to get in sight of a change constitutes one more shining illustration of the crudity of our attempts at governmental regulation. The worst class of "car hogs"—those who order ten times as much coal as they can unload—are calmly justifying themselves by the cheerfulness with which they pay for the delayed cars at the legal rate of one dollar a day.

THE NEEDED REFORM OF REGULATION

OUR esteemed contemporary, the St. Louis Times, has published two forceful editorials recently advocating the abolition of the Interstate Commerce Commission. The *Railway Age Gazette* agrees with the Times that "We want less regulation and more freedom for trained and experienced action." We agree with it that the increase of regulation has been accompanied by a decrease of railway development and expansion, and that the effect of this on general business has been bad. We don't agree with it as to the exact nature of the disease or as to the remedies.

The principle of regulation by commission rather than by legislative bodies seems to be sound. The trouble is with the way the principle is carried out. First, there is excessive duplication and innumerable conflicts between regulation by the several state governments and the national government. Second, the lawmakers, both state and national, constantly step in and adopt regulations, the determination of whose merits should be left to the commissions. Third, the laws regarding regulation, both those imposing specific requirements and those giving powers to the commissions, are all apparently predicated on the assumption that it is of great public moment that railways shall be kept from earning too much money, but that it is of no public moment that they shall not be kept from earning too little. Fourth, the performance of the functions delegated to commissions requires ability and expert knowledge, and very few of the commissioners possess this knowledge. These appear to be the great shortcomings of our policy and system of regulation.

The diagnosis of the disease suggests the remedies. The duplications, conflicts and inconsistencies between regulation by the state and the national governments should be abolished either by abolishing state regulation of railways or by making it subject to control by the Interstate Commerce Commission. State regulation has thus far almost everywhere been far less intelligent and has done much more harm and much less good than federal regulation. Having abolished state regulation or subordinated it to federal regulation Congress should delegate larger authority over some phases of the railway business, such as over operation and the issuance of railway securities to the Interstate Commerce Commission.

The laws under which the commission acts should, at the same time, be made less one-sided. The commission is the only governmental body ever created solely to repress and control an industry. Every other governmental body ever created to deal with any business has been given the duty of helping it as well as controlling it; and in practically every other case the duty of helping has been treated as more important than the duty of controlling. The commission should be given the authority to raise rates as well as to reduce them. It should be given the duty of helping to increase railway earnings when they are too low, as well as that of reducing them when they are too high. And it should show as much alacrity in performing the one function as the other. In order that the commission shall be made competent to carry its increased burdens it should be enlarged and reorganized. The law passed for this purpose should provide, among other things, that a certain number of the members of the commission shall be men expert in railway affairs at the time of their appointment.

The St. Louis Times believes that "the best way out of the matter would be to repeal all interstate commerce legislation and appropriation measures in order that a new start may be made." Certainly a new start is needed; and in order that it may be made the legislation regarding the Interstate Commerce Commission must be completely revised.

Before the needed reform of our system and policy of regulation can be secured the public must be made to understand the situation in the railway industry, the trend in the relations between our governments and our large business concerns, and the effect which will be produced on the general welfare if present tendencies are not arrested. The problem presented is not one which concerns merely the railways. All our experience for ten years has shown that the regulation applied to railways promptly serves as a precedent for regulation which is applied, first, to other public service corporations, then to other large business concerns, and then to smaller business concerns. The result is that the regulation applied to railways very soon, directly or indirectly, affects every community, class and individual.

For example, the way that the railways are regulated soon determines the way that some independent telephone line out in Iowa is regulated. The acceptance of the doctrine that railways should not benefit by the increase in the value of their land would establish a principle under which there could be confiscated not only the real estate on which their tracks are built, but the real estate on which their office buildings are built. If you can confiscate the value of the land under a railway office building in Chicago, which is far from the company's right of way, you can confiscate the value of the land under a country store building in Washington, Iowa, where Clifford Thorne lives. If you can do that, then you can confiscate the unearned increment in the land owned by every member of the Corn Belt Meat Producers' Association of Iowa, of whose interests Mr. Thorne is supposed to be the guardian angel.

In the long run we cannot make fish of one kind of private property and fowl of another. Already, many business men who have overlooked this fact in their efforts to hurt the railways in order to help themselves have found how quickly chickens will come home to roost. The needed reform of regulation presents a problem which affects the welfare of every citizen of this country.

ECONOMY IN THE SUPPLY DEPARTMENT

WHY is it so general on railways to fix a periodical appropriation for labor and disregard material entirely? This is a question which has often been asked, and the reply has invariably been that the amount of material required to carry out certain work is fixed; that there can be no "give and take" where material is concerned. But material can be wasted, just as easily as time and if the departments of a railway were held accountable for the money spent each month on material as well as for that spent for labor there would be considerable reductions in the total expenditures for maintenance. Moreover, the adoption of a plan of appropriation for material as well as labor makes much more easy the control of expenditures. That this is so has been demonstrated on the Seaboard Air Line, where such a plan is in operation and has proved highly satisfactory. An article published elsewhere in this issue tells in some detail what the methods are and what they are accomplishing; but one point in connection with this plan deserves more than passing notice. The success of the system and its value to the various officers whose work it affects is dependent largely on a report furnished by the stores department showing exactly what material has been used; this report is not made out two weeks or a month after the material has been placed in service; the information is available *at once,* so that each master mechanic can adjust his expenditures to meet his appropriation requirements.

The practices in the purchasing and distribution of material are of much interest, considered especially in the light of the results which they are bringing. In order to keep at a minimum the amount of money tied up in material, the stock is held at as low a point as possible; this is of course a condition which is striven for on all railways, but there are

considerable differences of opinion as to what the safe minimum of stock is which can be carried. But it must be recognized that if stock is to be kept down there must be prompt and efficient service in the purchasing and distribution of material, and there must be a system that will not permit of the holding of unused material at one point when it is needed at another. The efficient supply department must be both balanced and flexible, and it is impossible to go through the stores of the Seaboard and look into its supply department methods without being convinced that both these conditions obtain. The practices at all the stores are identical, although these stores vary greatly in size and in the amount of material handled; there is uniformity throughout, and yet the system is flexible.

Sometimes it is well to guard against over-enthusiasm about the reclamation of material. There is a point beyond which reclamation cannot go and still be economical. The work of reclamation on the Seaboard is comparatively new; it is not spectacular, but it is placed on a sound basis in that each branch of it must show that it is bringing in satisfactory returns or the work will be discontinued. In too many cases those in charge of reclamation work are given to making extravagant claims as to the economy realized, without having any substantial ground on which to base their claims. This is not the case on the Seaboard and the figures and analysis of costs which will be given in a later article on this subject should prove of the greatest value to others who are engaged in reclamation work, to whatever extent.

LOADING FREIGHT CARS TO CAPACITY

AT a time when the railroads are experiencing a net shortage of freight cars for the first time at this period of the year since 1907, it behooves every one who has anything to do with the handling of cars, or who has an interest in the prompt transportation of freight, to adopt every practicable means to promote the greatest efficiency of the available car supply.

This includes shippers and consignees, as well as railroads, not only because they are vitally interested in the adequacy of transportation facilities, but because, as freight cars are in their possession a large part of the time, and as they control the loading of carload freight, they have a great deal of influence on the problem of obtaining the maximum efficiency from railroad equipment.

When a freight car is used as a storage warehouse when it might be used for the purpose for which it was provided with wheels, or when it is sent on its journey loaded to only half or two-thirds of its capacity when it might be fully loaded, valuable transportation facilities are being wasted. It costs, the railroad just about as much to handle a partially loaded car as one fully loaded. It also costs the consignee or shipper who pays for switching just as much for a partially loaded car as for a full car, and the overhead expense of handling orders on the part of both the buyer and the seller is about the same for a small order as for a large order.

Some shippers have appreciated the fact that loading cars to their capacity not only helps the railroads but is of distinct benefit to the shippers themselves. It not only enables them to handle their business in larger transactions, but it tends to make it easier for them to secure an adequate supply of cars at times when they are most needed. Very effective cooperation of this kind has been rendered by some of the large shippers of steel, cement and lumber. Others have failed to appreciate the mutual advantages of capacity loading and have gone on ordering only a minimum carload when they could just as well in many cases have ordered a full carload. Then in times of a car shortage they have blamed the railroads for not maintaining at all times a supply of cars large enough to take care of the maximum demand that may be made at any time.

Railroads have tried to secure increases in the minimum carload weights and in some cases they have recently been successful in inducing commissions to allow them, but in many cases the commissions have been inclined to give consideration to the shippers who prefer to order in small quantities or whose commercial conditions require them to do so.

As a result, while the average capacity of freight cars increased in the period 1904-1914 by 30 per cent, the average carload increased less than 20 per cent.

The Chicago & North Western during the past two years has been engaged in a systematic campaign to increase the loading of its cars by working with the shippers and pointing out to them the advantages of heavier loading from their own standpoint as well as that of the railroad. The methods pursued and some of the results obtained are described elsewhere in this issue. The railroad cannot of course control the loading of cars, and it has found that in many cases it is impracticable for small shippers to use a full carload of materials or supplies at a time. However, it has also found a great many ready to co-operate with it when shown the advantages on their own side, not only of promoting an increase in the available car supply but also of protecting themselves by ordering in large quantities, against the consequences of a shortage of cars or of severe weather or other conditions which might delay shipments. As shown in the article the North Western has been conspicuously successful in its efforts in increasing the loading of many of the principal commodities which it handles. This has been accomplished by unremitting effort, by constant supervision to keep the entire organization alert to the importance of the campaign, and by unremitting effort in checking for instances of light loading and calling them to the attention of the shippers and consignees for the purpose of enlisting their co-operation.

As a large percentage of the freight cars loaded on a railroad are handled by other railroads before reaching their destination, any increase in carloading effected through the efforts of one road necessarily operates to the benefit of all roads. If the average carload of freight on all roads could be increased by even as little as 500 lb. it would result in a saving of about 162,000,000 car miles, which figuring on the basis of the average haul, 260 miles, would be equivalent to 623,000 cars.

UNITED STATES STEEL CORPORATION

THE present record activity in the iron and steel trade did not begin, insofar as the United States Steel Corporation is concerned, until the second quarter of the calendar year ended December 31, 1915. In the last quarter of 1915 the output of the Steel Corporation for all classes of rolled and other finished steel products for sale equalled the maximum steel producing capacity of the company's plants. The total production for the year of these products equalled about 85 per cent of the annual capacity of the mills and the prices received during the first half of the year had not been affected by the increased demand to any great extent.

The total earnings of the Corporation after the payment of expenses was $140,250,000 in 1915, an increase of $58,504,000 over 1914. There was charged off for depreciation and extraordinary replacements $24,409,000, or $7,364,000 more than in 1914; and after the payment of interest charges and sinking funds there was a balance available for dividends of $75,839,000 in 1915, comparing with $23,497,000 in 1914. The regular 7 per cent dividends on the preferred call for $25,220,000, and in 1915 one quarterly dividend of 1¼ per cent was declared on the common and in 1914 two quarterly dividends of 1½ per cent each were declared on the common. There was, therefore, a surplus, after the payment of dividends, in 1915 of $44,260,000, comparing with a deficit in 1914 of $16,972,000.

The subsidiary companies of the United States Steel Cor-

poration operate 147 different manufacturing works. Each one of these works includes various and numerous plants. There are 127 blast furnaces, 35 Bessemer converters and 312 open hearth furnaces; there are 582 rolling mills, 122 wire mills, 51 pipe and tube works, 3 tin plate mills, 20 bridge and structural plants, 38 galvanizing and tin departments, 5 splice bar and rail joint shops, 5 spike, bolt or nut factories, 5 departments for cold rolled products, 23 iron, steel or brass foundries, 12 sulphite of iron plants, 6 cement plants and 66 warehouses, besides 37 miscellaneous plants, such as steel car wheel plants, axle works, etc.

The Corporation through its subsidiary companies owns iron ore properties in the Missabe range, in the Vermilion range, in the Menominee range, in the Marquette range, in the Gogebic range and in the Baraboo range in the Lake Superior region, and in the Red Mountain range, Alabama brown ore pockets and Georgia brown ore pockets in the southern region. The Corporation has coal properties with 131,459 acres of coking coal, 96,618 acres of steam coal and 24,879 acres of surface, with 72 coke plants, 22,153 bee hive ovens and 1,262 by-product ovens, besides the coal and coke property of the Tennessee Coal, Iron and Railroad Company, which includes 178,734 acres of mineral interests and surface. The Corporation through its subsidiary companies owns 1,058 miles of standard gage railroad and other transportation facilities, including 9 ocean steamers, 71 lake steamers, 21 steel barges on the lakes and 71 steel barges on the Ohio river.

In 1915 there were 23,670,000 tons of iron ore mined, an increase as compared with 1914 of 38.95 per cent. There was 26,628,000 tons of coal mined, an increase as compared with 1914 of 25.83 per cent. The tons of coke manufactured totaled 14,501,000, or 29.77 per cent more than in 1914; the tons of pig iron, ferro and spiegel, 13,642,000, an increase of 35.70 per cent; the tons of steel ingots, 16,375,000, an increase of 38.47 per cent, and the tons of rolled and other finished steel products, 11,763,000, an increase of 30.49 per cent. There were 7,649,000 barrels of Universal Portland cement manufactured, a decrease as compared with 1914 of 16.10 per cent.

The average number of employees of the company during the entire year 1915 was 191,126. This is 6.56 per cent greater than the average number for 1914. The average salary or wage per day was $3.01, an increase of 1.35 per cent over 1914. Since the close of the calendar year an increase averaging approximately 10 per cent on the rates previously paid employees has gone into effect. If the business for 1916 is as great, and the prospects now are that it will be at least as great, as in 1913, this increased rate of wage will mean an increase of about $18,000,000 in the amount paid to employees per year.

The United States Steel Corporation has been one of the few large corporations which have successfully carried out a really helpful plan of profit sharing between corporation and employee. This is done by means of offering to the employees stock in the company on terms which yield to the employee a rate proportionate to the prosperity of the Corporation. On January 1 common stock was offered to employees at $85 and subscriptions were received from 24,940 employees, the aggregate subscription being for 49,742 shares. In addition to this plan of inducing employees to buy stock the Corporation is following a plan adopted in 1903 of payment of special compensation to employees meriting it. The company is now paying pensions to retired employees at the rate of about $660,000 a year. There is an aggregate of 3,002 names on the pension rolls.

The December 31 balance sheet shows $94,084,000 cash on hand, with total current liabilities of $64,834,000, including accrued taxes not yet due and provision for the 1915 federal income tax.

CAROLINA, CLINCHFIELD & OHIO AND VIRGINIAN

THE Carolina, Clinchfield & Ohio was a project financed by a small group of wealthy men who had acquired an interest in companies owning large tracts of coal lands in southwestern Virginia. The road was to serve two main purposes. It was to be an outlet for coal from these coal fields and to be a connecting link in a through route for merchandise freight from the Lakes and the Middle West to the southeastern Atlantic seaboard. The road was completed in 1910 from Dante, Va., to Spartanburg, S. C., with a short branch to Wilder, Va., a total of 256 miles. The extension north from Dante to Elkhorn City, where a connection is made with a branch of the Chesapeake & Ohio, was completed June 30, 1915, so that the fiscal year ended June 30, 1915, marks the end of an epoch in the road's history.

Previous to the opening of the Dante-Elkhorn extension the road was operated in two divisions of a little over one hundred miles each. One is from Dante south to Irwin, a piece of railroad which did not require extraordinarily heavy expenditures, considering the character of the country, to obtain an easy grade for hauling very long coal trains south. The other division is from Irwin to Spartanburg and the road has to climb the Blue Ridge mountains, and on this division a very heavy expenditure of capital was made to obtain comparatively low grades southbound over the Blue Ridge. To justify as heavy expenditures as were made, the road should show a very low operating ratio, and this it does. The fiscal year ended June 30, 1915, was a very trying one for all the roads in the South, and with a large decrease in coal traffic the Carolina, Clinchfield & Ohio was put to a test such as it is hardly likely to have to go through again. Total operating revenues amounted to $2,261,000, a falling off as compared with the previous year of 15.62 per cent. Operating expenses amounted to $1,192,000, a decrease of but 5.02 per cent. After paying expenses, taxes and interest charges on its outstanding securities the company had $148,000 net income. In 1914 the net income had been $700,000, and 6 per cent dividends were paid in that year on the outstanding $10,000,000 preferred stock. No dividends were declared in 1915.

The Virginian was built by the late H. H. Rogers, not so much to develop new coal fields in West Virginia as to give an outlet to coal fields which the other roads, and especially the Chesapeake & Ohio, had refused to give the facilities which had been demanded. Mr. Rogers was interested in many of the mines in the West Virginia fields in the neighborhood of Deepwater. Most of these mines lie west of the Alleghenies and to build a line to tidewater it was necessary to cross the same ridge of mountains which the Dante-Elkhorn extension of the Carolina, Clinchfield & Ohio crosses. In the case of the Virginian, however, the coal for tidewater had to be hauled over these mountains, whereas the Clinchfield gets its coal east of the Alleghenies but has to haul it over the Blue Ridge, whereas the Virginian, by following up the valley of the river and maintaining a high ridge across to the valley of the Roanoke river, makes an easy crossing of the Blue Ridge. No part, therefore, of the operations of the Carolina, Clinchfield & Ohio is as expensive as the Virginian's haul up over Clarks Gap summit, while on the other hand the Carolina, Clinchfield & Ohio has no such long, down grade, easy haul as the Virginian has from Roanoke to tidewater at Norfolk.

The total mileage of the Virginian is 504. Total operating revenues in the fiscal year ended June 30, 1915, amounted to $5,820,000, a decrease as compared with the previous year of $520,000. Total operating expenses amounted to $3,377,000, a decrease as compared with the

previous year of $156,000. After paying taxes and interest charges there was $738,000 surplus, comparing with $1,261,000 surplus in the previous year. No dividends were paid in 1915 or 1914.

Before comparing figures for capitalization and certain operating statistics it is well to point out certain underlying differences between the two roads. The Virginian has its own coal docks at Norfolk and is therefore not dependent on any other road for the outlet for its coal. The Carolina, Clinchfield & Ohio ends at Spartanburg, where it connects with the Southern Railway main line running to Atlanta, Mobile and New Orleans, and with the Southern Railway lines running to Charleston, S. C., and Savannah, Ga. The Clinchfield owns property in Charleston and had started to build a coal pier there, but the Southern Railway built a pier which gives facilities for handling coal, including Clinchfield coal, which make the Clinchfield's own coal pier at present superfluous. The Clinchfield also crosses the Seaboard Air Line at Bostec, N. C. The original intention had been to either sell the Clinchfield to the Seaboard Air Line or make some joint arrangements for handling traffic. These arrangements, however, were never consummated. The Virginian is and was intended to be a competitive road. It competes directly with both the Chesapeake & Ohio and the Norfolk & Western. The Clinchfield is supplemental to the other roads in its territory not destructively competitive with them.

The Virginian operates 504 miles of line; the Clinchfield, 256. The Virginian has outstanding $31,271,500 common stock and $27,955,000 5 per cent cumulative preferred stock, a total of $59,226,500. The Clinchfield has $25,000,000 common stock and $10,000,000 non-cumulative preferred, a total of $35,000,000. The Virginian has $27,000,000 5 per cent first mortgage bonds and $1,312,000 equipment trust notes outstanding, while the Clinchfield has $13,700,000 first mortgage 5 per cent bonds, $2,000,000 10-year 5 per cent notes, a non-negotiable debt to the Cumberland Corporation, which controls the coal companies, of $663,521, and $2,682,000 equipment trust certificates, a total of $19,045,521. In addition there are $5,500,000 Elkhorn extension first mortgage bonds issued to build the extension north from Dante, but which may be left out of consideration in the present comparison.

The Virginian's operating ratio in 1915 was 58.02 per cent, comparing with 55.73 per cent in 1914; and the Clinchfield's was 52.72 per cent in 1915, comparing with 46.85 per cent in 1914. The Virginian, however, gets an average revenue per ton per mile of 3.43 mills, as against the Clinchfield average revenue per ton per mile of 5.6 mills. The average revenue trainload of the Virginian was 1,469 tons in 1915, comparing with 1,410 tons in 1914; and of the Clinchfield, 1,095 tons in 1915, comparing with 1,202 tons in 1914. The freight density of the Virginian in 1915 was 2,934,000; in 1914, 3,369,000. Freight density of the Clinchfield was 1,405,000 in 1915 and 1,654,000 in 1914. Total transportation expenses of the Virginian amounted to $1,305,000 in 1915, a decrease as compared with 1914 of $176,000. Transportation expenses on the Clinchfield amounted to $449,000 in 1915, a decrease as compared with 1914 of $57,000.

Nineteen fifteen was the sixth year of operation for the Virginian and its maintenance of way expenses were $754,000, comparing with $846,000 in 1914. The Clinchfield's maintenance of way expenses were $251,000 in 1915, comparing with $191,000 in 1914. It is evident that certain items of renewal are just beginning to be felt on the Clinchfield, but it is likewise evident that the policy of the management is not to neglect these renewals even in a year such as 1915 where there might have been a temptation so to do. The Clinchfield's traffic is yet so light compared with the capacity of the road that it has only one to two tonnage freight trains south over its line each day. A falling off in coal tonnage, therefore, was particularly hard to meet by a reduction in transportation expenses. The much smaller average trainload was, as far as can be determined, due not to less efficient operation, but to a determination to keep local freight service up despite a falling off in this traffic and the necessity of moving sometimes even tonnage trains without their full rating. The Virginian probably experienced something of these same difficulties, but its much greater freight density prevented them from so seriously affecting the trainload.

The following figures show how these two independent coal roads fared in a year of very severe depression:

	Virginian		Clinchfield	
	1915	1914	1915	1914
Mileage operated	504	503	256	256
Freight revenue	$5,070,491	$5,790,645	$2,022,779	$2,400,350
Passenger revenue	403,448	387,993	185,484	224,580
Total operating revenues	5,820,406	6,340,079	2,260,776	2,679,208
Maint. of way and structures.	753,734	846,211	250,578	190,867
Maintenance of equipment	1,017,546	1,004,113	278,773	330,396
Traffic expenses	65,103	65,260	101,441	102,917
Transportation expenses	1,304,616	1,481,339	449,416	506,225
Miscellaneous expenses	117,004	.....	.....	.....
General expenses	152,242	136,297	125,538	124,882
Transportation for investment —Cr.	33,393	.....	13,437	.....
Total operating expenses	3,376,851	3,533,221	1,192,309	1,255,287
Taxes	253,336	257,195	164,267	131,322
Operating income	2,190,218	2,549,664	904,200	1,292,599
Gross income	2,403,678	2,890,488	1,136,773	1,666,421
Net income	737,921	1,260,853	147,806	700,114

NEW BOOKS

Corrosion of Iron.—By L. C. Wilson. Bound in cloth. 169 pages, 4¼ in. by 7¼ in. Published by The Engineering Magazine Company, 140 Nassau street, New York. Price $2.

This book is a revision of a series of articles recently published in The Engineering Magazine. The author's purpose has been to assemble and condense the most interesting and important studies and facts connected with the corrosion of iron and its protection therefrom. Considerable practical information is included concerning materials available for the preservation of iron and steel.

Proceedings of the Traveling Engineers' Association.—Bound in leather. 329 pages, 5½ in. by 8½ in. Published by the association, W. O. Thompson, secretary, New York Central Railroad, Cleveland, Ohio.

This is the proceedings of the twenty-third annual convention of the association held in Chicago, September, 1915. The subjects covered include: The effect of lubricating and mechanical firing on locomotive operating costs; recommended practice for employing and training new firemen; smoke prevention; advantages of superheaters, brick arches, etc.; improving the handling of air brakes; the electro-pneumatic brake; valve gear and its relation to fuel economy and operating costs; scientific train loading.

The Mechanical Engineers' Pocket-Book.—By William Kent, M.E., Sc.D. Bound in leather, 1,477 pages, 4 in. by 6¾ in. Illustrated and indexed. Ninth edition, revised and enlarged. Published by John Wiley & Sons, Inc., New York. Price $5.

This reference book is so well and favorably known among engineers that it scarcely needs any special notice. In this, the ninth edition, the work has been thoroughly revised with the assistance of Robert Thurston Kent, M. E., consulting engineer. Extensive revisions have been made in the subjects of materials, mechanics, fans and blowers, heating and ventilation, fuel, steam boilers and engines and steam turbines. The new matter includes much data on such subjects as planing, milling, drilling and grinding, and the chapter on machine shop practice has been rewritten and doubled in size. The matter pertaining to electrical engineering has been completely rewritten and brought into agreement with present practice, and many new tables have been added.

Letters to the Editor

ADVERTISING SAFETY WITHOUT PROVIDING IT

NEW YORK, N. Y.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

C. J. Morrison writes in your January 28 issue:

> Sometimes a great movement that is productive of much good to humanity is partly nullified by too much praise and too much advertising. Such would seem to be the case with safety first. Surely no sane person will deny that this is a great movement, and that it has saved many lives and prevented many injuries, but it has been so extensively advertised that it is becoming a byword instead of a great movement.

He cites several incidents to prove his assumption.

These incidents all go to show the misuse of "safety first" signs and how different individuals are crying "safety first" when they do not provide safety. In other words, instead of the movement being partly nullified by too much praise and too much advertising, the movement is handicapped by misapplication of safety principles, by the promiscuous use of signs instead of physical improvements and educational measures.

An attempt of this kind to create false impressions in the public mind is not confined to the safety movement, as is illustrated by imitative trade marks and products, where the original has established for itself an enviable and commercially advantageous reputation. So it is with safety. One corporation will provide safety and advertise it and another will become envious and advertise safety without providing it. But should we say that the movement is receiving too much praise because of this, or should we say that the misusers of safety slogans have reached the first stage of transformation, by indicating that they realize the advantage of public confidence and are taking some methods to obtain this confidence?

Mr. Morrison points out several incidents where safety could be obtained by correcting physical defects, and concludes that we need fewer signs and more action. True we need more action, and possibly the sign manufacturers have been over-zealous in marketing their wares, but surely we shall not condemn the safety movement nor take away any of the praise from the legitimate exponents of it, on account of those parasites which live by the endeavors of the public's benefactors.

R. W. HICKS,
Mechanical Engineer.

POORLY QUALIFIED RAILROAD ADVOCATES*

EAU CLAIRE, WIS.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

An editorial in your issue of March 3 entitled "Wherein Railway Men Neglect Their Business," calls to mind a fact which must often have impressed observing railroad men: that in meeting the public in open conferences, or in appearing before commercial bodies in an effort to demonstrate the necessity for higher passenger and freight rates, the railways, in too many instances, have not been effectively represented.

An executive officer may be nothing short of a wizard in railway work; or he may be a giant in the operating department. He may be beautifully fitted for work in the passenger department, a man of faultless taste and tact, fully capable of meeting the public individually and in commercial bodies in a semi-social way; or he may be an after-dinner speaker of marked ability. Then again, he may be such an expert traffic man as to be master of the thousand intricacies of freight rates; and such an adept in handling complaints of shippers as to beat the safety committees in reducing the annual total of claim payments.

But these qualifications are not enough. A fit representative of the railways in the work of convincing the public, must be a man of inexhaustible patience; practiced in the art of repartee and forensics, and with a dignified yet common way about him. His language must not be too academic—preferably somewhat homely. He must be able to deal effectively with any thrust from a stranger; he must refuse to recognize the sting in it, and be ready to belittle its force by a humorous retort which carries a refutation with it. He must know such simple facts as how the stocks of the railways are quoted on the exchanges; he must be on speaking terms with the financial situation of the railways whom he represents. He must have, either within his memory or immediately available, some of the rates affecting the territory in which he is speaking.

There are quite a few general managers who could undoubtedly meet these requirements; but it is exceedingly rare to find any operating officer below this grade who has a wide enough view of the manifold interests of a railway to measure up to the job. But, what with the never-ceasing committee meetings and similar occasions which take their heavy toll of a general manager's valuable time, very, very few of them could find time to answer the call for any considerable campaign.

But we have one department left to draw from, where usually may be found admirable talent, and the temperament and training for the purpose. I refer to the legal department. Not every railway would find such a man in its legal department, but there are a good many of them, here and there, and arrangements could be made to distribute their services. Many railway legal officers who have not done much in this line could be trained very quickly. Place before these men the salient points in the work of the various departments which would be likely to arise in public discussions. I venture to say that the data which it would be necessary to tabulate and index for this purpose would make a book no larger than many a Supreme Court brief.

The legal departments of most roads are very busy at times, of course; still I cannot but believe that it is worth the price to place this matter in their hands, rather than to send out operating men who have narrowed their lives down to operating problems and who, consequently, for a number of years have been in considerable degree out of touch with commercial struggles.

Most of these public meetings and hearings are attended by hardheaded business men. Some of them may wear their trousers a little baggy and their string ties may be a little frayed, but we must not make the mistake of underestimating their powers of cross-examination. These business experts—that is what they are—are the men who must be won over, if the case of the railways is to stand upon a firm basis instead of on the shifting sands of public sentiment.

That the railways have a good sound cause with respect to advances in rates, especially in intrastate passenger rates, few thinking men who know the facts will deny. Must this cause fail for lack of advocates equal to the task? What a disgrace! A failure can only be laid to the door of disinclination born of lethargy, or because those who should be wide awake are just now being lulled into repose with the siren song that the pendulum of public opinion is swinging in their favor, and are forgetting that by the same token there must be a return sweep.

There are some railway attorneys who have voluntarily studied their clients' case from the standpoint of publicity and their successes are noteworthy. How much more efficient then, would be an organized effort by these men whose profession requires the very qualifications, in varying degrees, so sorely needed in stating the railways' case and defending it before all sorts of tribunals.

NEMESIS.

*This letter, inadvertently omitted from last week's paper, was the subject of editorial comment on the first page of that issue.—EDITOR.

Senate Committee Hearing on Railway Mail Pay

Ralph Peters, Frank Trumbull, Samuel Rea, L. F. Johnson and Others Oppose Space Basis of Mail Pay

On March 20, 21 and 22 the Committee on Railway Mail Pay, representing 263 railroad companies, and other representatives of the railroads, appeared before the Senate Committee on Post Offices and Post Roads, with Senator John H. Bankhead presiding, to oppose the Moon bill fixing the rate of railway mail pay on a space basis. Ralph Peters, president of the Long Island Railroad and chairman of the Committee on Railway Mail Pay, made the first statement announcing that his committee represents companies operating 227,741 miles of railroad.

The following is an abstract of this statement, with the language of the statement preserved insofar as is possible:

RALPH PETERS' STATEMENT.

The report of the postmaster general for the year ended June 30, 1915, in discussing the failure to pass the post-office appropriation bill at the last session of Congress, which then, as now, carried with it the so-called "Moon bill" as a rider, implied that the opposition to the space basis of pay as provided by the bill came from a minority of the railroads. To remove any misapprehension in this regard my committee wishes to state that on May 20, 1915, a meeting of railroad executives, representing approximately 90 per cent of the entire mileage of the country, was held in New York and adopted the following resolutions unanimously:

"Resolved, That the position of the Committee on Railway Mail Pay has the approval of the representatives of the railroads present at this meeting, and that the railways of the United States continue to give their united support to the committee in its efforts to secure to the railways adequate compensation for transporting the mails.

"Resolved, further, That we believe the so-called space basis as proposed in the last Congress is wrong, and susceptible in practice of grave injustice to the railways in denying payment for services rendered.

"Resolved, further, That we endorse the views of the committee on the superiority of the existing weight basis, amended by annual weighing, payment for apartment cars and payment for, or release from, side or terminal messenger service.

"Resolved, further, That the Committee on Railway Mail Pay is urged to continue its work on this basis, and to ask Congress to enact a law that will give the Interstate Commerce Commission the same jurisdiction over the mail traffic that it now has over all other traffic of the railroads."

In order to set at rest any further doubts that there may be on this point I desire to place on record the following letter which I have been specifically authorized to sign on behalf of the executive officers of 64 railroads.

Hon. John H. Bankhead, Chairman,
Committee on Post Offices and Post Roads,
United States Senate, Washington, D. C.

Dear Sir:—

In order to make clear to your committee the attitude of the railroads towards the pending legislation relative to railway mail pay, the undersigned chief executive officers of the railroads desire to express to you their sincere conviction that the adoption of a space basis for pay which completely ignores the weight of mails actually carried would prove unjust, discriminatory and even confiscatory.

Before inaugurating the system proposed in the rider to the Post Office Appropriation Bill with its uncertainties, inequalities and discriminations, we respectfully suggest that Congress direct the Interstate Commerce Commission to investigate the subject and report its conclusions. [The names of the railroads were put on the record and include all of the more important roads of the United States.]

There is no division of opinion among the railroads as to the serious results that are almost sure to follow should the bill under consideration be enacted into a law. This committee has consistently and earnestly opposed any plan for paying the railroads for handling the mails on the basis of space authorized as represented by a car, half car or lineal feet provided for closed pouch mail.

We have had no difficulty in convincing the public mind, as represented by the press, nor have we had any difficulty in having our arguments and statements analyzed by thoughtful and consistent experts in various commercial and civic organizations who have reached the same conclusion that we have that it would be a disastrous thing for the entire merchandise rate structure of the country to have a proposition such as is proposed by section 16 on this appropriation bill enacted into law.

The rate of pay must be universal,—the rate of postage is universal,—and this was recognized in the law of 1873. The scales ascertained the daily weight and the computation fixed the daily average; the chain measured the route and fixed the number of miles by which the compensation was multiplied to determine the aggregate pay. There was no guesswork about it. All roads are treated alike. With an annual weighing this could well be called a scientific, simple and reasonable basis of pay.

On the other hand, an average car-mile rate can never be made compensatory; it cannot be strictly and rigidly administered. It is indefinite, depending absolutely on the judgment of the official that authorizes the rate; there is no elasticity about it. To be economically administered it means a curtailment of service, a step backward in the development of postal service. The average car-mile rate as proposed is ascertained from car-mile earnings in passenger service, which includes roads where average car-mile earnings are below 20 cents per mile. It also includes roads where the passenger car-mile earnings are over 30 cents. The average car-mile rate would not compensate the latter railroads but would more than compensate the former roads.

On February 8, 1916, Judge Moon said that the railroads are going to get nearly $64,000,000 if the bill changing from weight to space system is passed. On February 11, 1916, Mr. Madden figured that the total pay under the bill if passed would be $69,251,090 against $63,000,000 under the present plan, or a difference of $6,000,000. This looks pretty good, but there seems to be a pretty strong string attachment. Mr. Moon said in the same speech referred to above: "Is it possible that they (the railroads) could complain when we are giving them now under the provisions of the new bill nearly $4,000,000 more than they have ever gotten under any bill? . . . But you may ask me, if it is costing more by three or four million dollars in the first place to go to the space basis than to remain on the weight basis, why should we make the change? My answer is . . . Your department can handle the cars for which they pay for the space and can so adjust the loading and unloading and the transportation as to recoup within a year or two every dollar that is lost by the change in the basis of compensation from weight to space." Further, on the same day: "The department estimates that within a few years by the control and ownership of this space your parcels post

system can be extended and prices probably reduced in the first and second zone."

In discussing a similar bill to the present one which was not passed by the last legislature Mr. Moon said: "The saving will occur, as the department thinks, in the handling of the mail. . . . You will have enough space under the contract to carry all your parcels post, probably, without any additional compensation and save many million dollars annually." Again Mr. Moon said: "Adopt this new plan and you will hold the service down practically to the same figure every year. . . . The truth about it is that the compensation that will be received by the railroad companies in the next year if this bill is adopted in my judgment will be practically the same compensation that they receive at the present time." Let me read you what Congressman Lloyd would have his railroad friends believe he really thinks about this suggestion. [Mr. Peters read into the record correspondence between President Felton, of the Chicago Great Western, and Congressman Lloyd in which the following paragraphs occurred in one of Mr. Lloyd's letters]:

The railroad companies received in 1912, the year before the new parcel post law went into effect, $51,700,000. In 1913, $51,960,000; one-half of that year was under the new parcel post system. In 1914 the railroad companies received $56,155,000; the fiscal year 1915, $59,676,000.

The postoffice department estimates that the transportation by railroad cost the government 2.08 cents per pound on parcel matter. The estimate of the postoffice department for the six-months' period between January 1 and June 30 in 1913 is that 400,000,000 lb. of parcel post matter was transported. In 1914, 1,200,000,000 lb., and in 1915 1,600,000,000 lb.

If there was no increase in the mail for the years 1913, 1914 and 1915 in other classes of mail matter, the transportation companies would be entitled to the two cents per pound on the extra amount of parcel matter handled in those years, and for the fiscal year 1913 it would have amounted to $6,000,000; $18,000,000 in 1914, and $24,000,000 in 1915. This is based upon the statement which the postoffice department gives, that one-fourth of the transportation in expense goes to other transportation companies than the railroads. Now, if you add to the amount received by the railroads in 1912 the amount added by parcel post in 1913, the railroad companies should have received $57,691,000; in 1914 $69,691,000, and 1915 $75,691,000.

If these statements are anything like correct, then the railroad companies should have received in addition to the compensation which they did receive for the year 1913, $5,292,000; in 1914, $13,500,000, and in 1915 $16,000,000.

We are here to advocate two propositions: first, that the carriers should be paid on a fair basis and at a fair rate for what they do, and nothing more; and second, that Congress should sacrifice itself beyond all peradventure that new and untried methods of pay such as the space basis will not encourage,—nay force,—the postoffice department into activities that are not proper functions of the postal service.

Four government commissions have, since 1873, investigated the subject of railway mail pay and not one of these commissions has ever rendered an opinion that the railroads were overpaid.

Let me try to illustrate what space as a basis for the payment for mail means by drawing a parallel with the passenger service. The average passenger coach on roads having $1,000,000 or more operating revenues will seat about 66 passengers. For every mile that coach ran in 1915 it carried an average of 15 passengers at a little less than two cents per mile and earned gross 29.77 cents per mile run. In the eastern district the average earnings per coach mile were 31.83 cents; in the western district 28.89 cents, and in the southern district 26.72 cents. On some railroads in densely populated sections the earnings run up as high as 40 cents per car-mile, and as the country becomes more thickly settled the railroads receive an increasing average return from this coach service, *because every additional passenger pays the additional fare at the average rate*, so that for all increased service rendered the public in this way the railroads will obtain a legitimate increase in compensation. Suppose Congress was to pass a law that passenger cars should be rented for an average rate of "not exceeding" 30 cents per car-mile; the immediate result would be that a company would be incorporated for the sole purpose of leasing all the passenger cars in the country so that it might for the future enjoy all the increment from the increasing traffic. What happens,—the earnings of the railroads from their coach service would be crystallized right at that rate per car-mile and no matter how many passengers they might handle per car, how much greater service they might render the public, or to what extent their expenses might be increased, all they could get would be "not exceeding" 30 cents per car-mile. Of course, to make the parallel complete Congress would have to provide that the carriers must perform the service under a heavy penalty.

This is just what would happen with the mail cars under a space basis of payment. The rate per car-mile becomes a permanent, fixed and immovable factor that will not vary with the load or the service, and the carriers will never be permitted to benefit by or participate in the increased loading of cars which it is the definite and undisguised purpose of the postoffice department officials to put into effect with a view to decreasing the cost of transportation to the department.

However, the plain fact is that the rates specified in this bill, to use a homely expression, "cut no ice." They might as well be 30 cents a car-mile or 40 cents a car-mile as 20 cents or 21 cents. The unlimited discretion allowed the postmaster general and the arbitrary power given him to enforce service from the railroad companies, make the rates utterly ineffective if he is disposed to exert the powers given him by the bill.

It would almost seem that the author of this law felt that its provisions were so unreasonable, so unjust and so un-American that the railroads could only be induced to submit to them by actual force in the way of a fine so heavy that they could not afford to test their rights.

The adoption of a space basis as a method of payment for transportation is a leap in the dark. I want again to urge on the committee the propriety of securing a recommendation from the Interstate Commerce Commission—a body that is probably better qualified than any other in the country—to appraise the competitive conditions that will be created by this legislation before action is taken. The carriers feel that if an official expression came from the Interstate Commerce Commission as to what rates would be fair it would be accepted by the people, by the railroads and by Congress itself.

We submit herewith a suggestion as to a bill.

The Suggested Railway Mail Pay Bill.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That from and after the passage of this act the postmaster general shall not less frequently than once in every year cause the mails to be weighed simultaneously on all railroad mail routes for a period of thirty successive working days, and when such annual weighing is completed, he shall readjust the annual compensation of railway mail pay on the basis of the average daily weight of all the mail carried on each route, as ascertained by the actual weight taken, as hereinbefore provided, which readjustment shall be effective on and after the 1st of July following the annual weighing.

Section 2. Six months after the passage of this act the postmaster general shall only require a railroad mail carrier to provide for the carriage of the mails between any of its stations and a postoffice or postal station when such postoffice or postal station is located in the railroad depot or station of such carrier: Provided, That the postmaster general may contract with railroad companies, or with other persons for the performance of such side or messenger service not embraced in this section at the lowest rates obtainable.

Six months after the passage of this act pay shall be allowed by the postmaster general for all space in mail apartments in cars operated under orders of the postmaster general used for railway postoffice purposes, at the same rate

per lineal foot of car length as that now authorized by law to be paid for space in full railway postoffice cars 60 ft. long.

Section 3. The Interstate Commerce Commission is directed to make a full investigation of the justice and reasonableness of existing rates, for railway mail pay, and of the practices and regulations of the postoffice department which affect the justice or reasonableness of the rates for all the service rendered by railroads in carrying mail, making specific findings as to whether the present rates should be increased or decreased, and, if either, how much. Notice shall be given by the commission of its action under this section to the postmaster general and to the railroads that may be affected, and after hearing had of the parties interested, in accordance with its rules of procedure, it shall report to Congress, at the earliest practicable date, the result of its investigation, with such recommendations as to rates, practices and regulations as the commission may deem proper. For the purpose of such investigation the Interstate Commerce Commission shall have all powers which it is now authorized to exercise in the investigation of the reasonableness of rates, and the postmaster general shall supply such information regarding the mail service as may be requested by the Interstate Commerce Commission.

The following is a very brief abstract from a statement submitted by W. A. Worthington, vice-president of the Southern Pacific:

MR. WORTHINGTON'S STATEMENT.

I have tried to follow the line of reasoning of those who are no doubt sincerely convinced that the space plan is proper and an improvement over the weight basis and believe these gentlemen base their conclusions on the following general assumptions:

1. That it costs the railways little more to move a large carload than a small carload because the weight of the car itself represents the far greater part of the total weight of car and contents.

2. That if the space pay bears a relation to the earnings per car-mile from passenger service, the department thereby would pay the railways sufficient for the entire space in the car and should be permitted to use it.

Replying to these conclusions, I would say:

1. If the space rates proposed were based on the cost of the service, the first argument would have some weight, but the rates proposed have no relation to the cost of the service, though it is contended they have a relation to the revenues now received per car-mile from passenger service. It can be clearly shown by reference to recent decisions of the Interstate Commerce Commission and by any fair apportionment of railway expenses to passenger service, that the revenues from passenger train service as a whole are below what they should be. The passenger revenues are lowered by State laws and regulations, over which the federal government has no jurisdiction, such as 2-cent passenger laws, etc., some of these having already been found by the courts confiscatory. The Interstate Commerce Commission has recently given a number of the roads permission to raise passenger rates; increases in them are being made wherever possible, and in addition to this the railways have the opportunity of improving passenger earnings per car-mile through better loading of cars.

Thus the basis upon which the space rates are fixed is too low even if they equal the present passenger revenues per car-mile. These passenger revenues per car-mile can, as has been explained, be increased in future, and if any space rate based upon them is made for mail the same opportunity to receive increased pay as the load in the car is increased should be accorded the railways.

Let us assume, however, merely for the purpose of illustration that space adequate to compensate the carriers for the expense of carrying the present loads in mail cars are fixed, but that provision is not made to increase these rates as the loads increase, because of the theory that the cost to the railway is not thereby made greater. The increased load does increase the weight of the car and to that extent does increase the direct cost of movement. It may be admitted, however, that the direct costs of movement are not increased in proportion to the weight carried, but it must be remembered that this relates only to direct hauling costs and that the total of these hauling costs represents only about one-third of the total expenses of conducting the operations of the railway. For the other two-thirds of the expenses every ton of mail, every ton of express, every ton of freight and every passenger should bear its pro-rata share regardless of the load in the car, if we are to follow the principles laid down in decisions of the Supreme Court. Relieving any class of traffic from this principle merely means the transfer of an undue burden of these charges to other traffic and to other patrons of the railways for the benefit of the preferred class. The space basis directly violates this principle in that added load in the car after the space rates are once established contributes no revenue whatever to pay not only the direct train expenses, but to pay the greater railway costs that do not depend upon car or train loading. (The latter class of expenses might be illustrated by citing the greater part of maintenance of way and structures, including, for example, ordinary and extraordinary repairs of roadbed, fencing, also station and terminal expenses, administration, general expenses, and return on investment, these all being expenses incurred on account of the railway traffic as a whole and chargeable to every part of it.)

I would here like to digress a moment and mention a very serious omission which the joint Congressional committee made in computing passenger revenues per car-mile, from which a deduction of 10 per cent was made to fix the mail rate. The computation was made by dividing the total passenger revenue proper by the space in passenger trains after deducting the mail space and the express space. Now this passenger space included sleeping cars, dining cars and baggage cars, as to all of which special compensation is collected from the public aside from the ordinary passenger revenue. The magnitude of this omitted revenue is really very considerable. We receive revenues from excess baggage, special collections from parlor car seats, revenue from chartered cars, special revenue from dining cars, and the Pullman Company collects from passengers a revenue for occupying sleeping cars.

Statistics are not available for the United States, but for the lines of the Southern Pacific Company this special passenger revenue amounted in a year to $5,103,553, or nearly twice our mail revenue, and it is 18 per cent as much as the ordinary passenger revenue.

If the same rule follows for all other railroads, then the 26 cents per car-mile found by the Congressional committee for passenger service should be increased to 30 cents to determine the earning of passenger cars per car-mile. Then, adopting the committee's rule of deducting 10 per cent from 30 cents, the committee should have computed 27 cents as their basing rate for mail instead of about 22 cents.

Statements were also submitted by C. A. Searle, manager of mail traffic of the Chicago, Rock Island & Pacific, and by H. E. Mack, manager of mail traffic of the Missouri Pacific.

The following statement was made by Frank Trumbull, chairman of the board of directors of the Chesapeake & Ohio:

MR. TRUMBULL'S STATEMENT

This problem of payment for the carrying of the mails, which is immediately before us, appears to me to be only a part of the larger question of railroad regulation, which is before the country and upon the proper solution of which the whole future of the railroads depends.

The railroads of this country have long since accepted the

principle of regulation. Having done this, they now feel it their duty to promote in any way they can the development of a symmetrical and efficient system. No regulatory method is efficient or ever can be in which the responsibility is divided. Congress has never attempted to deal directly with freight rates or passenger fares or express rates and within eighteen months has enacted the so-called Clayton Bill, which, among other things, refers to the Interstate Commerce Commission the responsibility of deciding certain questions which may arise under the anti-trust laws. Congress was wise in creating such a commission but it should have more power and responsibility instead of less.

In the commission's decision in the Eastern rate case it asserted, among other things, the following: "That such reasonable passenger fares may be charged as would yield a fair return upon the property devoted to passenger use, and further—that, in general, each class of service, including mail and express, should contribute its just proportion to the economic cost of operation."

Now the commission has jurisdiction over freight, passenger and express rates, but in endeavoring to deal honestly and fairly with the railroads it is perfectly helpless in many respects, including an intelligent determination of what the mail should contribute "as its just proportion." The Post Office department is simply a large shipper; all other shippers as well as the railroads subject themselves to the jurisdiction of the commission, and it is entirely consistent with a general scheme of regulation to make it comprehensive instead of piece-meal. In fact, any other program is inconsistent. So far as I know, Congress has never even entertained the thought of permitting any other shipper to fix his own rates either in whole or in part.

The unfairness of authorizing one of the parties at interest to sit as judge on a disputed question seems to me to be obvious. What everybody wants is comprehensive and efficient regulation but the division of responsibility between governmental departments and between forty-eight states is not efficient regulation: it is locomotor ataxia.

Railroad investors do not ask favors, but do expect fair treatment and Congress can well afford, as a matter of governmental policy, to give jurisdiction to its deputy—the Interstate Commerce Commission.

The following is the statement made by Samuel Rea, President of the Pennsylvania Railroad:

Mr. Rea's Statement

I will ask you to credit me with having tried to get a little above the purely selfish point of view. Naturally, as a railroad officer, I wish to see this matter adjusted in a way that will assure fair treatment to the railroads. It cannot be questioned that they are entitled to just pay for every service they are called upon to render, whether to a great department of the government or to a private citizen.

But I also want to see a settlement that will be perfectly fair to the Post Office department, and that will command and deserve the confidence of the people. The department should certainly be free to develop its true usefulness unhampered, and to call upon the railroads for whatever services its proper needs require, the sole condition being that it shall fully compensate the railroads.

Now, as to the best way to obtain these results.

As you may know, I am a thorough believer in the system which this country has adopted of the public regulation of railroads. The people through the Congress long ago decided that the only fair way to settle questions as to what the railroads ought to be paid for their services was to have some impartial body to do it. This is founded upon one of the first principles of law, that of having differences settled judicially.

The question of pay for mail transportation has been a subject of dispute and controversy for 30 or 40 years. Neither the railroads nor the Post Office department has ever been satisfied. We may as well be frank and admit that their views are widely divergent and the differences between them seem to be irreconcilable.

One of the greatest objections that I could possibly name to the mail pay legislation that is pending before you is that it would not settle these differences, but would only intensify them. What else could by any chance be expected from the passage of a coercive measure against which every railroad in the country has protested?

The solution that I suggest is this: Turn the whole matter over to the Interstate Commerce Commission. Let the commission study it carefully and then advise Congress as to what changes are required in the method of pay or the rates in order to do justice to both the railroads and the Post Office department.

The question of pay for carrying the mails and parcel post has become a most intricate study in rates. The Interstate Commerce Commission is the nation's expert body on rates and was created by Congress to serve that purpose. It is better fitted than any other branch of the government to reach a fair conclusion. Both the railroads and the government, I am sure, would be willing to abide by its judgment. Gentlemen of the Senate committee, if you decide to recommend this resolution to the Senate, I am sure it will satisfactorily determine the question, and you will receive public approval for one of the fairest and wisest steps ever taken by a committee of Congress.

Mr. Rea was followed by L. E. Johnson, president of the Norfolk & Western, who endorsed the presentation that had been made by the Committee on Railway Mail Pay and urged that the present method for arriving at the amount carried and basis of rates to be paid for mail, while not wholly adequate, should be continued until the Interstate Commerce Commission had had an opportunity to make a full investigation into the matter in the same manner as the commission would adopt in investigating rate questions.

S. M. Felton, president of the Chicago Great Western, followed Mr. Johnson urging also that the Interstate Commerce Commission should make an investigation of the railway mail pay question before any law was passed in regard to it by Congress. The following paragraphs occurred in Mr. Felton's statement:

Mr. Felton's Statement

Imagine for a moment the war department or the navy department being placed in a position to make their own rates on troops or supplies, or whatever might be necessary in the conduct of their departments. Such a program, in my judgment, would never be considered for a moment by the gentlemen of this committee; yet the Post-Office department is seeking this special privilege that has never been accorded to any branch of the government heretofore. The officers of the army and navy, the soldiers and sailors all pay their fare. Under the Moon bill there would be but few officers or employees of the Post-Office department who would not ride free over the railroads of this country, and more than that, their free transportation would not be confined to the mail cars.

A. H. Smith, president of the New York Central, made a statement in part as follows:

Mr. Smith's Statement

This is a day of fair play, special privileges being abolished by enlightened legislation. The government should set the example of asking no special privilege for itself, and since the rates proposed are considered by the railroads to be unremunerative, they would constitute discrimination in favor of the government. The government has entrusted other problems of railroad management to the Interstate

Commerce Commission and it should, we think, entrust this one to that body for fair consideration.

We are perhaps the greatest mail carrying line in the United States. We perhaps receive in the aggregate slightly more than any other line, and yet as you divide the mileage into what we receive we get about $600 [a mile]—$50 a month, for carrying the mail. If the Interstate Commerce Commission has too much to do let it organize a department or detail one of its members to organize a department and make a study of the railway mail pay subject. We have to organize to meet emergencies, as is the case now with the situation at New York and in New England on account of the freight blockade. Mr. Rea suggests that I overlook the fact that one member of the Interstate Commerce Commission is sitting with us in this study in New York now. In answer to a question from Senator Hardwick Mr. Smith said: "This question should be submitted to the Interstate Commerce Commission for a conclusion, the same as in any investigation. The government should have the same faith in the commission in regard to this that it has in the commission in regard to other things."

WEDNESDAY'S HEARING

At Wednesday's session F. B. Deberard, director of research of the Merchants' Association of New York, presented resolutions adopted by 45 chambers of commerce in 22 states, protesting against the Moon rider and the space plan. Mr. Deberard said that the present freight congestion, and the inability of the railroads to handle traffic was ample reason why Congress should refrain from any legislation which would further impair railroad revenues. He declared that heavy parcel post was disorganizing postal service and that this fact was shown by mailing of test letters and newspapers. Mr. Deberard said that the only way to end the controversy over railway mail pay was to refer it to the Interstate Commerce Commission.

Herbert Sheridan, traffic manager of the Baltimore Chamber of Commerce, spoke on similar lines.

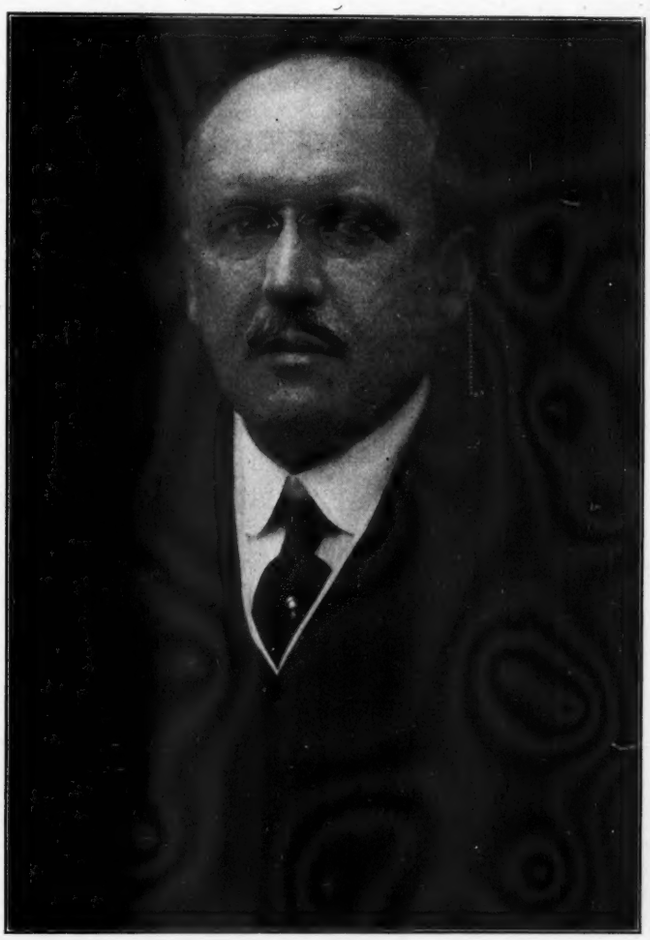
V. J. Bradley, general supervisor of mail traffic of the Pennsylvania Railroad, told the committee that the railroads have lost fifty millions of dollars since 1907 by reason of cuts in pay for carrying mails. The law of 1912 requiring postal cars to be built of steel, he said, had added fifteen million dollars to their expenses in less than four years. Since 1873 he asserted mail tonnage carried by railroads has been growing more than three times as fast as the pay for it. Mr. Bradley urged that the question be turned over to the Interstate Commerce Commission.

WOMEN WORKERS ON ENGLISH RAILWAYS.—The scope of female labor on the English railways is gradually being extended. Bill-posting is now one of their vocations.

AGNEW T. DICE

A. T. Dice, vice-president and general manager of the Philadelphia & Reading, has been elected president, succeeding Theodore Voorhees, deceased. Mr. Dice has been general manager of the Philadelphia & Reading since January 1, 1910, and vice-president since January 1, 1913. Mr. Dice has had 35 years' service as a railroad officer and for the last 22 years has been with the Philadelphia & Reading.

Agnew Thompson Dice was born on November 2, 1862, at Scotland, Pa. He began railway work in 1881 as flagman, with the engineering corps of the Pennsylvania Railroad, later being made rodman and later promoted to assistant engineer. In 1887-88 he was engaged on special work in connection with signaling at Altoona, Pa., and then was made assistant supervisor. In 1890 he was promoted to supervisor, serving two years, and then went to the New York Central & Hudson River as superintendent of signals. On January 1, 1893, Mr. Dice was appointed assistant superintendent of the Hudson division. In April, 1894, he went to the Philadelphia & Reading as superintendent of the Atlantic City Railroad. Three years later he was made assistant superintendent of the Reading division of the Philadelphia & Reading, in charge of freight terminals at Philadelphia. After a month's service he was made superintendent of the Shamokin division. In May, 1903, he was appointed general superintendent of the Philadelphia & Reading and on January 1, 1910, was made general manager. Three years later he was made vice-president and general manager of the Philadelphia & Reading. Mr. Dice was a member of the committee of which Elisha Lee was chairman, which dealt with the demands of the eastern trainmen for increased wages in 1913.



A. T. Dice

Mr. Dice has been for a number of years chairman of the Committee on Maintenance of the American Railway Association.

RAILROADS IN WAR TIME.—In the cloak rooms of the capitol at Washington fault is found with the Federal Administration and the railroads because Columbus, N. M., is on a single track railroad which cannot handle military troop and supply trains rapidly. Congress is finding out how much depends on the condition of railroads in time of war, yet it does not show much inclination to help them. We are lucky to have so much railroad accommodation along the Mexican frontier. We cannot expect Villa to pick out points where railroad service is of the best when raiding our frontier, and we cannot very well ask the Southern Pacific to build a four-track railroad parallel to the border when the government forces it to carry parcel post matter at rates far below cost of transportation.—*New York Commercial.*

Supply Department Methods on the Seaboard

Organization Places Them Under the General Purchasing Agent; Substantial Reductions in Purchases and Stock

It has been said that the purpose of the supply department of a railway should be to provide a minimum of material and that at the lowest net cost. The basic idea should not be to have large material issues, but to conserve material to obtain full efficiency from what is purchased, and reclaim all material that can be economically reclaimed, using the profits thus realized. The stores department must give *service.*

Changes of considerable magnitude have been made in the purchasing and stores department practices on the Seaboard Air Line during the past three years. The criticism may be raised that some of the practices now employed are not new; they are not, however, familiar to railway men in general in this country, and an inspection of what they have accomplished on the Seaboard will show that they are well worthy of a careful study. A start was made at installing the present methods during the last quarter of 1913 and what has been accomplished since that time, both in the reduction of the material on hand and the amount purchased, can be seen from the accompanying diagrams and statement. In September, 1913, the total material on hand on the system was valued at $2,528,703, while the corresponding figures for December, 1915, were $1,482,163, a reduction of considerably over a million dollars. In September, 1913, the stock issued amounted to $224,836, while in December, 1915, this amounted to $386,570.93, the percentage of stock issued in the former case being 26 and in the latter case 40, while at the same time the cost of handling in and out, per thousand dollars, was reduced from $14.14 in September, 1913, to $9.93 in December, 1915.

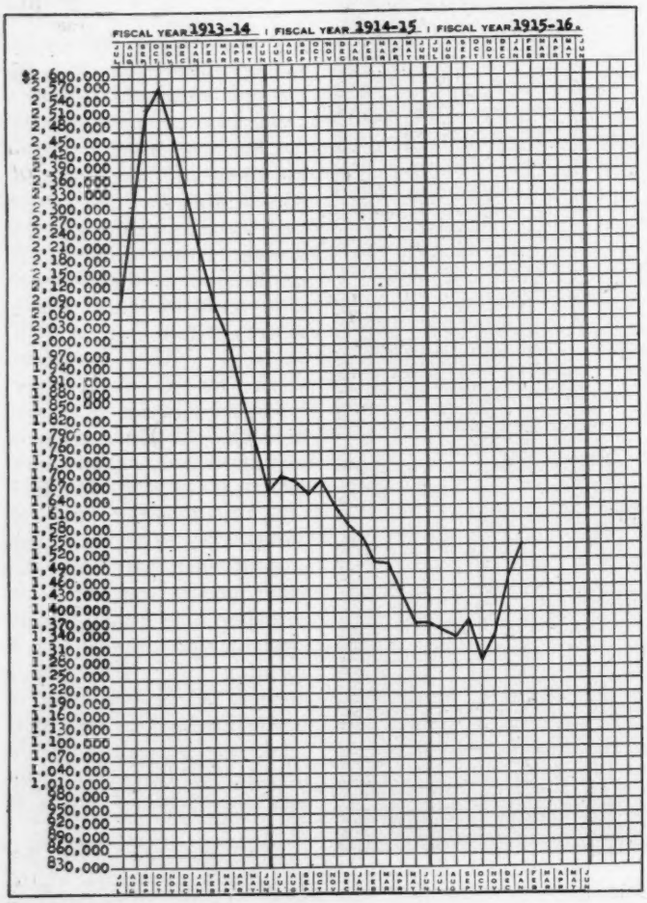


Diagram Showing Material and Supplies on Hand for the Past Three Years

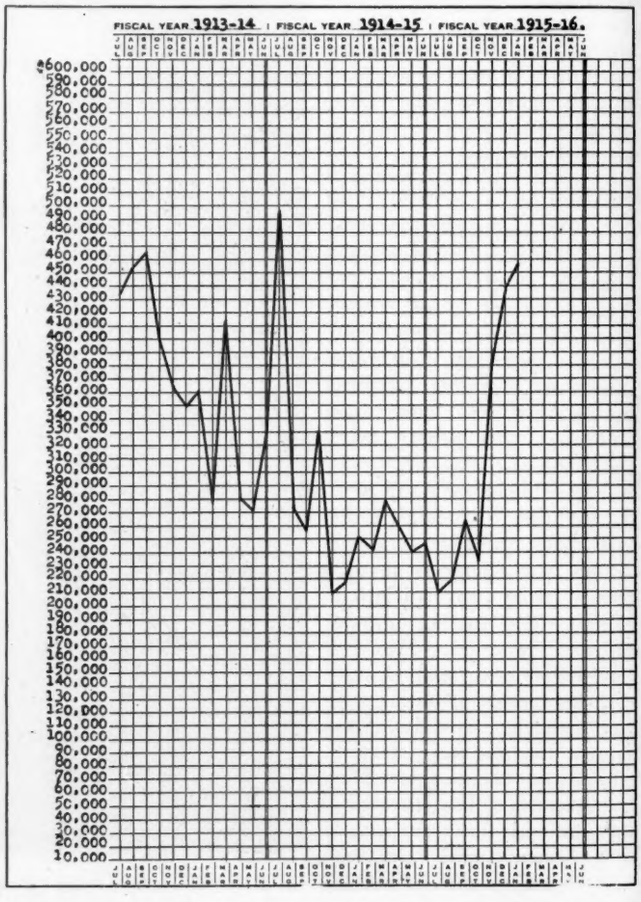


Diagram Showing Purchases During the Past Three Years

Organization

The Seaboard was no exception among railways in the matter of having large quantities of material charged out because of the inability of the stores department organization to take care of it. As is frequently the case, the mechanical department carried the stock of finished material, and what are known as special materials. One way to reduce stock when it is received is to charge it out and this practice is common on almost all railroads. The fact that the present stores department organization on the Seaboard has taken back charged out and unapplied material to the value of $260,000.00 and allowed credit to the proper operating accounts shows the extent to which this practice can be carried.

A stores department organization should be strong enough and have sufficient force to properly and economically handle all supplies and at the same time should be sufficiently flexible to be able to economically meet maximum and minimum conditions. It was with these ideas in mind that the organization which was started in the latter part of 1913 was de-

veloped. The accompanying diagram shows the plan of organization. The basis of this system is the locating of a storekeeper at any point where sufficient unapplied material is kept to require the services of one or more men. When the place is not large enough to warrant a separate storekeeper, the work, including that of keeping the standard stock books, can be done by a "joint" man, or one who works for some other department, generally the mechanical department, and who will report in so far as material is concerned to the storekeeper of the division. The division storekeepers, storekeeper of the general store, stationery storekeeper and the inspector of stores, as well as the foreman of the reclamation plant, reports to the general storekeeper, who has charge of all unapplied material regardless of where it is located on the line, with the exception of rail, ties, and commissary stock. The general storekeeper, the assistant to the general purchasing agent and the tie and timber agent report to the general purchasing agent.

The general store, being the jobbing house of the system is really the transfer point, and its real purpose is promptness of delivery, or the immediate filling of requisitions. The general store of the Seaboard Air Line is located at Portsmouth, Va., which is the gateway to the markets and to the railway system. The headquarters of the general storekeeper are located at this general store, while the six division storekeepers who report to him are located at Raleigh, N. C.; Hamlet, N. C.; Atlanta, Ga.; Andrews, S. C.; Savannah, Ga., and Jacksonville, Fla. In order to take advantage of the market by being able to buy in larger quantities and ship in carload lots, all standard material is handled through the Portsmouth general store. This enables the department to concentrate all material at the general store and give immediate service and shipment to all outside stations and divisions. It also permits of the stock of all division and local stores being kept at the lowest possible point. The reclamation work is carried on at Portsmouth, and unless there are good reasons which make the practice uneconomical, all material is received and inspected at the general store at Portsmouth. In addition all surplus and obsolete stock is assembled and carried at the general store so that the resources of the road are conserved and the material is placed where it is always ready for service and can be handled at the least possible cost.

SEABOARD AIR LINE RAILWAY

STATEMENT SHOWING AMOUNT OF MATERIAL ON HAND, PURCHASED, ISSUED AND RECOVERED AND COSTS OF HANDLING, September 1913 & December 1915

	YEAR	Balance On Hand First of Month	Receipts Purchased	Receipts From Other Departments and Transfers	Total Receipts	Total Available	Issues	Balance On Hand Close of Month	Percent of Stock Issued	LABOR: Total Store Bills	LABOR: Less Charges To Other Departments	LABOR: Charges From Other Departments	LABOR: Cost of Operation	Cost Per $100.00 Issued	Cost Per $100.00 In and Out	Total Charges To Store Expense	Total Cost Per $100.00 To Purchase, Handle and Acct. for Mat'l	MATERIAL RECOVERED: Turned Over By Other Departments	MATERIAL RECOVERED: Recovered By Supply Cars	MATERIAL RECOVERED: Recovered From Scrap	MATERIAL RECOVERED: Total Material Recovered
Sept.	1913	6685443 32	983009 95	1081177 61	2024878 60	2508021 92	2248836 48	6260685 44	26	7378 65	2006 64	670 73	6042 78	26 18	1 11	14	8769 12	12805 60	00	00	12805 60
Total. Dec.	1915	5378690 91	2068524	1782477 76	3851000 00	9629490 91	3865709 93	5763780 98	40	10346 25	3268 79	983 36	8060 82	20 90	9 93	10695 40		3223 01	334 08	10079 85	13636 94
								1765859													
Engineering Material Account,								15203 68													
								683740 33													
Total Stores,								591802 66													
								423494 43													
Roadway Material,								181896 07													
								53240 09													
Old Material,								73515 65													
								13225 18													
Shop Orders.								7105 33													
								571069 58													
Rail,								449465 26													
								320885 87													
Ties.								49070 50													
								175822 24													
Coal and Wood,								118690 94													
								25258 53													
Dining Car Supplies,								10618 40													
	1913							2528703 58													
Total Material,	1915							1482162 81													

CORRECT D. D. Cain
General Storekeeper.

Comparative Statement of Purchases, etc., for September, 1913 and December, 1915

Sectional Arrangement of Material at Storehouses.

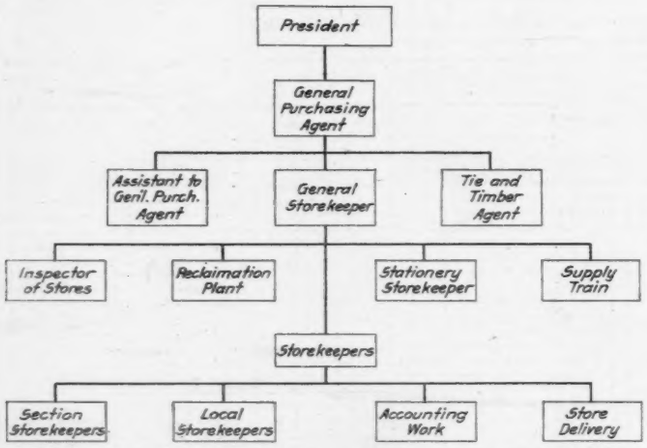
The material at the general store, as well as that at the other storehouses, is divided into 22 sections for the convenience of handling and shipping. The classification of material in these 22 divisions is shown in one of the illustrations. Each section of material, or as many as can be properly handled at any point by one man, is under the control of what are known as section storekeepers. The material in each section is arranged alphabetically and must be kept in first-class condition at all times for quick stock taking. These section storekeepers are provided with the standard stock books which are in use at all points at which stores are located. Each section is operated as a separate store and each section storekeeper keeps his own stock book, in which he takes accurate stock every 30 days. These stock books are all made at one time and are exact copies of one another; the descriptions shown in them are the standard descriptions by which the material is purchased. In other words, there are no "nicknames" employed. The stock books show the amount of each class of material on hand, the amount ordered, the requisition numbers and the amount received. The section storekeeper becomes a specialist in his particular line of material and is the man who orders, receives, unpacks and places on the shelves all material for his section. Requisitions coming to any of the stores are made out in accordance with the sectional arrangement of material, and after being registered are sent to the different section storekeepers for filling, so that at Portsmouth the several storekeepers are working on requisitions from one point at the same time and can thus fill all the requisitions from a large store in one day.

Each section storekeeper has a helper who is really a student or apprentice and these helpers are drawn on when vacancies occur among the section storekeepers. This practice provides for the stores department men who become experts in the handling of material in their particular section and who will know at a glance whether the material which is being purchased is what it should be. As an example of the smooth working of this organization, the monthly stock is regularly taken in one day. The last annual inventory was taken under the observation of the comptroller and the auditor of disbursements and assistants and the work was carried out in seven hours. This was done in order to demonstrate to these officers the effectiveness of the system and the methods of organization which are in use.

Store Delivery

Instead of the mechanics in the various shops coming to the stores to draw material, all material is delivered from the stores direct to the shops as it is required by what is

known as the store delivery system. This store delivery is the connecting link between the storehouse and the shops in the same way as the supply train, referred to later, is the link between the storehouse and the line of road. Boxes are located around the shops at specified points, selected for their convenience, and in these the store order tickets are deposited by the various foremen. These tickets are collected periodically by boys assigned especially for this purpose, the average length of time between trips being from ten to fifteen minutes. These order slips are brought to the store, where the material is provided, and the boys then carry it wherever it is wanted in the shops; laborers are used for the heavier work. These boys are under the jurisdiction of a store delivery foreman who keeps in touch with the shops regarding delays, etc. One of the greatest benefits of a system of this kind is that the storekeeper, through his store delivery foreman, knows whether or not the material which has been drawn is used. Thus all unapplied material is promptly returned to stock. This delivery system is already in effect at the general store as well as the Jacksonville and Savannah divisional stores. At both of these points an annunciator is used, located in the store and operated by push buttons at the various stations, so that the boys know just when a ticket is in any box. This system is also to be employed in connection with the new shops at Portsmouth.



Organization of the Supply Department of the Seaboard Air Line

As an illustration of the savings that can be made at even the smaller stores, the figures given below are of interest. These were obtained at Jacksonville, the cost of obtaining material by the mechanics being computed by the mechanical department. As the time which the men were away from their work was kept careful track of by means of a stop watch, it will be readily understood that they would absent themselves from their work as short a time as possible, so that the figures can be considered conservative as regards the savings effected by the use of a store delivery system.

STORE DELIVERIES, SHOWING COMPARATIVE COST AT JACKSONVILLE SHOPS, JANUARY, 1916

Machine shop	3,372 deliveries at .0339 cents		$114.16
Roundhouse	1,852 deliveries at .0216 cents		39.91
Car shops	486 deliveries at .0794 cents		38.59
Total	5,710		$192.66
Former cost	5,710 deliveries at .10 cents		$571.00
Saving by use of store delivery system			378.34

This system prevents shop men from entering the stores building at all and the common practice of having these men loafing around while waiting for material is done away with. Instead of this the mechanics remain in the shops at their work, and the material is taken to them by lower priced help. It is also evident that there will be a considerable moral effect on the entire shop force as regards the saving of time, aside from other considerations.

REQUISITIONS

Requisitions from all departments, after approval, are sent direct to the general storekeeper. Upon arrival in his office they are turned over to the general stock clerk who is provided with a copy of all material reports from the division engineers. When requisitions are received from any store, they are first checked against the material on hand, either at the stores or on the various divisions. When the storekeepers make requisitions, they at the same time make the invoices, the shipping notices and the shipping records, the forms for all of these being bound in the same pad. This avoids a duplication of work at the shipping store. If the material is on hand, the necessary transfer is made; if it is not on hand at any point on the road, a purchase requisition is made on the general purchasing agent. Requisitions are made on the general purchasing agent only after every other resource has been exhausted. This can be done only by having all the material, both on the road and in the storehouses, under the control of the general storekeeper, as is the case in this organization.

SEABOARD AIR LINE R'Y

SECTIONAL ARRANGEMENT OF MATERIAL IN STOREHOUSES

Section	DESCRIPTION OF MATERIAL
1	Maintenace of Way Material, Steam Shovel Parts, Hand-Car, Motor Car and Velocipede Parts.
2	Bolts, Nuts, Lag Screws, Studs, Stay Bolts, Rivets, Washers.
3	Sheet Iron, Brass, Copper, Lead, Tin, Zinc, Springs, Tubing, Chain, Wire Rope, Jacks.
4	Boiler, Fire Box and Tank Steel, Bar Iron, Bar Steel, Piston Rods, Flues, Pipe.
5	Brads, Nails, Tacks, Staples, Handles, Shovels, Rope, Building Paper, Boiler Lagging, Pipe Covering.
6	Finished and Rough Brass, Pig Metals [except Journal Bearings].
7	Air Brakes, Injectors, Lubricators, Automatic Sanders, Steam Heat Equipment, Pintsch Gas, Acetylene Gas Material, Electric Headlights and Parts.
8	Shelf and Building Hardware, Small Tools, Metallic Piston and Valve Stem Packing, Car Trimmings, Fixtures, and Seat Parts.
9	Water Service Material, Plumbing Supplies, Pipe Fittings, Globe, Angle and Gas Valves, Pumps.
10	Upholstering Material, Canvas, Carpet, Linoleum.
11	Glass, Brushes, Painters' Supplies, Acids, Paint and Varnish.
12	Belting, Hose, Packing, Rubber and Leather Goods.
13	Station and Train Supplies, Lanterns, Lamps, Glassware, Tinware, Furniture.
14	Rough Iron and Steel Locomotive Castings and Forgings, Roadway Castings.
15	Car Castings and Forgings, Brake Beams, Bolsters, Trucks, Couplers and Parts, Switch Chains and Ropes, Stoves and Parts, Journal Bearings.
16	Wheels and Axles [Mounted and Unmounted], Wheel Centers, Front Ends, Cylinders, Tires, Boilers, Fire Boxes, Tanks.
17	Lumber, All Kinds, Rough and Finished.
18	Fire Clay, Brick, Cement, Coke, Charcoal, Hard Coal, Smithing Coal, Asphalt, Foundry and Welding Supplies.
19	Oils, Waste, Grease, Compounds.
20	Electrical Material, Telegraph and Telephone Parts, Electrical Machinery, Shop Motors, etc., Signal and Interlocking Material.
21	Scrap, All Kinds.
22	Stationery.

INSTRUCTIONS—All requisitions must be made to conform to the sectional arrangement. A separate requisition for each section. Exception is made for material issued from the supply cars and over the counter.

D. D. CAIN,
General Storekeeper.

Classification of the Material Under the Sectional Arrangement

All purchase requisitions are made by the general store and if for general store stock are based on the technical description given in the general store stock book. These purchase requisitions are all numbered by the general storekeeper, the same number being retained throughout the process of purchasing, receiving and vouchering the material. It is also used as a file number in tracing for the material, or in any correspondence connected with it. The key to this requisition is, of course, obtained from the stock book. There is but one requisition form employed for requisitions from every department.

Periodical Reports for Mechanical Department

The general storekeeper has charge of all of the work of accounting for material. Periodical reports are prepared for the mechanical department and the figures are available each day, showing the total expenditure to each account. A weekly report is made up which shows the total charges to each account for material for that particular period and this report must be in the hands of each master mechanic and the superintendent of motive power two days after the closing of the period. This information is required because of the fact that all departments work on appropriations, not only for labor but for material as well, so that if the mechanical department officers can save on material, it provides just so much more money to be expended on labor. The credit for whatever material is turned in is immediately available for application on the current appropriation.

It will be seen that the appropriation plan for material has a most important and direct effect on the control of expenditures. A flat appropriation covering a specified period is not flexible enough for control. Probably the real reason for this plan not having been generally adopted is because of the belief that it is expensive, but it has been proved on the Seaboard that the work can be done by the stores department with very little increased expense. In addition to serving the purpose of keeping expenditures for material under control at all times, and holding shop superintendents, master mechanics, etc., responsible for expenditures, it has a far-reaching effect on the use and control of material. Probably no other one thing has done more to curb unnecessary purchases and control the use of material than the practical application of the appropriation plan on the Seaboard.

The results are reflected in the statistics for nine months ending March 31, 1915, which show that the mechanical department payrolls were reduced 4.9 per cent, while at the same time the cost for material was reduced 20.3 per cent.

Supply Train

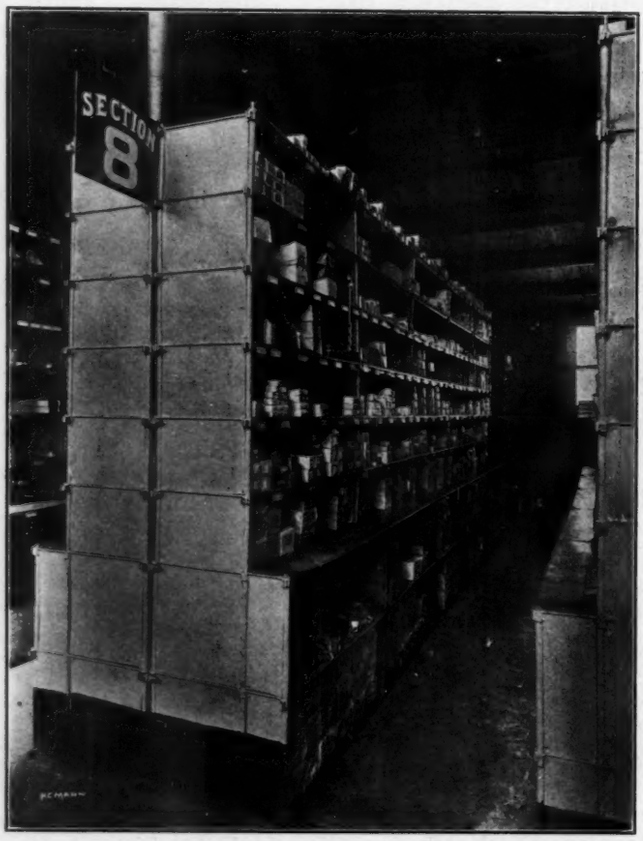
The distribution of material and the collection of scrap material or any that is to be returned to the general store, is carried out by means of a supply train. The entire system is covered by one supply train which moves over the three Northern divisions one month and the three Southern divisions the following month, thus giving a distribution of material once every sixty days. This train is in charge of a supply car storekeeper who has three helpers. The train consists of one general supply car, one oil and gasoline car, one stationery car, one dining and sleeping car, one flat car for spikes, one flat car for bolts and whatever additional cars may be found necessary. Side-boarded cars are also carried in the train for the purpose of picking up scrap.

Interior of the General Store at Portsmouth, Showing the Sectional Numbering and the Desks of the Section Storekeepers. This Is a Two-Story Building with Electric Elevator Service and Outside Platforms for the Heavy Material.

This train operates over divisions according to a prearranged schedule so that every one knows just when it will be at his section or station. The section foremen and their men meet the train and obtain from it whatever supplies are necessary, at the same time loading all scrap and any other material which they have to turn in. Roadmasters and division engineers always accompany this train, as do the superintendents whenever possible, so that anything connected with the delivery or the picking up of material is decided on the ground by those in authority. Toolhouses are checked against the standard list of tools and any surplus or obsolete tools are taken up. Repaired tools in first-class condition are also exchanged for tools which require repairing. The big point in the delivery of material in this way is

that when the supply train leaves the section foreman his immediate superior knows that he has been provided with tools and material sufficient to meet all his requirements for the next 60 days. There is no unnecessary delay at any station, as each of the supply train men knows his assignment and goes directly about his work, the material for delivery having been made ready between stops. The stops do not average more than five minutes in length. With the supply train in use section foremen know they can depend on getting their scrap loaded, which would not be the case if local freight trains were depended on for this work.

On the first trip of the supply train in 1913, there was picked up and brought to the general store and actually credited to three divisions, material which was not in use, valued at $8,006.86. These figures do not include allowances for large quantities of scrap which were picked up. It is of interest, however, to note some of the items which were



One of the Racks, Showing the Neat Arrangement of the Material. This Shelving Is Made in the Store, Mostly from Scrap Material

included in this material, such as 2,022 picks, 525 claw bars, 386 track chisels, 133 track jacks, 126 switch, marker and semaphore lamps. It should be understood that this material was not in stock; it was simply unusual material which was found at the various section houses and stations.

While the first purpose of the supply train is to establish uniform deliveries to the users on the ground, it is far reaching in its effect on the economical use and the abuse of material. It places the supply department officers in personal contact with the application of material. It also places the division officers in actual touch with the use of material and enables them not only to provide for their requirements, but to see that they are getting the full measure of usefulness from the tools and materials furnished them. Last and most important of all, it ensures against the purchase of unnecessary or unsuitable material and tools.

Another point which should be fully recognized is that the men on the supply train provide what is found to be needed, regardless of whether they have an approved requisition for it or not.

Stationery

Stationery is not treated differently in any way from other material. It is included as one of the sections in the sectional arrangement. The stationery supply is located at the general store, from which all through cars move direct. In cases of large shipments to superintendents, division engineers, etc., they are consigned in such cars; otherwise, the stationery supply is carried by the supply train. The stationery car is in charge of a helper who is familiar with the stationery and who inspects the stock on hand at the various stations while the supply train is delivering supplies to the agents and section foremen. All stationery is carried in stock until used and any special forms of which over 5,000 per month are used are also kept on hand at the general store. The stationery car of the supply train is loaded with a complete supply of all forms, each form being carried in a bin provided for that purpose. Stationery is not issued in packages, the expense and annoyance due to wrapping thus being avoided. If it is found when the supply train reaches any point that the agent has not ordered any of certain forms of stationery, the stationery storekeeper has authority to deliver the required material regardless of whether it was ordered or not. Any surplus stationery is picked up and the necessary supply for 60 days delivered to the agent.

Before the inauguration of a stationery car in connection with the supply train, the stationery was shipped from the general stationery store and all requisitions were checked by the stationery storekeeper. It was found no matter how careful he was in this checking, in addition to the checking by the different trainmasters, that the supply train picked up enough stationery at the various points to supply the agents' demands for three or four months without drawing on the supply at the general store.

Experience has shown that the printing of certain forms can be more cheaply done by the railroad itself than by outside work, and a small printing plant is operated by three men at the general store at Portsmouth. During the month of January, 1916, there were turned out of this plant 957,650 sheets at a cost of $359.05, including all charges. As outside work this would have cost $521.51, a direct saving of $162.46 for the month.

During the fiscal year ending June 30, 1915, the reduction in the cost of stationery and printing on the Seaboard system over that of the previous year, due directly to more efficient methods, was $21,487.29.

DISCUSSION OF SMOKE ABATEMENT REPORT

At the annual Electrical Night meeting of the New York Railroad Club, which was held on March 17, George Gibbs, of Gibbs & Hill, consulting engineers, of New York, presented a paper which was in the main an abstract of the smoke abatement report of the Chicago Association of Commerce. Portions of this report were published in the *Railway Age Gazette* of December 3, 1915, pages 1040 and 1047; December 10, page 1089; December 17, page 1125; December 24, page 1193; and January 7, 1916, page 49. After Mr. Gibbs' paper had been presented the meeting was devoted to a general discussion in which several prominent railway electrical engineers and other engineers interested in the subject participated.

William McClellan, consulting engineer of New York, said that he questioned the right of a city to compel any railroad or combination of railroads to stand the entire expense of a purely civic improvement, such as the electrification of the Chicago terminals for the sole purpose of elim-

inating 5 per cent of the gases pollution and 4 per cent of the solid pollution of Chicago's atmosphere, would be. Mr. McClellan said that he agreed with Col. Prouty of the Interstate Commerce Commission, who maintained that a railroad performs its entire duty in transporting passengers and freight with minimum delay and reasonable comfort; that the magnificent passenger terminals, which have been erected in some cities, while forming dignified terminals to great railroad systems are not absolutely essential to the transportation of passengers and would, therefore, more properly come under the head of civic improvements rather than legitimate railroad improvements. Mr. McClellan held that in the case of Chicago, the entire electrification of the railroad terminals as a means of reducing the smoke nuisance, would, in the same manner, be classed as a civic improvement and the expense therewith should be borne by the city benefited.

He said it might be claimed that the saving in operating expenses effected by electric operation, would warrant the expenditure by the railroads. He then pointed out that the total annual charge on the total cost of the electrification would be $16,946,436 and that the operating saving would be only $2,336,693, thus leaving an annual deficit of $14,609,743.

Mr. McClellan also called attention to the fact that the committee of the Chicago Association of Commerce, when compiling its estimate of the cost of electrifying the Chicago terminal, was undoubtedly impressed by the knowledge that the estimate would be subjected to the most searching scrutiny by those particularly interested in forcing such an electrification. For this reason, he said, it is reasonable to assume that the estimate as finally prepared is most conservative and would not, perhaps, cover the total cost incident to the complete electrification. Considering the magnitude of this work which would involve the electrification of 3,476 miles of track, a large proportion of which are in the form of complicated yards, and also considering the amount of reconstruction work necessary, such as regrading yards and tracks, terminal approaches and overhead crossings, it would be unusual if many extra expenses did not creep in that could not have been foreseen. This is always true where the work is new and where it is carried on under new conditions, necessitating frequent changes in design and in construction.

Mr. McClellan pointed out that the cost of the improvement as estimated by the committee was held, by them, to be so great as to warrant their reporting the electrification to be financially impracticable, and in calling attention to the probable conservative nature of their estimate, he said he intended not to criticise but rather to strengthen the committee's contention in regard to the financial impracticability.

C. H. Quinn, chief electrical engineer of the Norfolk & Western, brought out the fact that the locomotives engaged in suburban passenger service, contrary to public opinion, produced only 1.54 per cent of the visible smoke in the city while yard and transfer locomotives produced 15.03 per cent of the total. In other words, the service which had appeared so objectionable and which, no doubt, started the agitation for electrification really is not so great a smoke producer as the yard and transfer service about which little complaint was made, and that the per cent of the total smoke in the city produced by steam locomotives is exceedingly small as compared to other agencies.

It was the unanimous opinion of those who entered into the discussion that the investigation of the Chicago Association of Commerce Committee on Smoke Abatement and Electrification of Railway Terminals was the most comprehensive and complete work of the kind that has ever been attempted.

THE ERIE RAILROAD LIBRARY

The Erie Railroad has opened at its general office in New York City a free circulating and reference library for the use of the 1,300 persons employed in the offices of the company in that building and nearby. On the day that the library was opened, March 14, the shelves were almost swept clear of the several hundred volumes which had been provided; and a "rush order" was sent out for more books. The demand was keen from all classes of employees, from girls who count tickets in the auditing department up to the higher officers.

The library is on the fourteenth floor of the general offices, No. 50 Church street, and is in charge of Mrs. C. A. Vaughan, a librarian of experience. It consists of standard text books and reference works, engineering and technical books of interest to railroad men and also the latest popular fiction, together with current periodicals and newspapers. Employees in all departments will here find facilities to educate themselves in their own work and also to inform themselves concerning other departments of the railway service. The library contains about 1,000 books, of which something like 500 were out when the picture given herewith was taken. Only Erie Railroad employees are allowed to take out books. Only one book may be borrowed at a time; it may be kept one week with the privilege of renewal for another week, provided request has not been made to reserve it by someone else, and provided it is not a seven-day book. A penalty of one cent a day is charged for books overdue.

The Erie Library

The leading spirit in the establishment of the library has been President F. D. Underwood, and he has aimed to aid the employees in their general education, using that term in as broad a sense as any employee may desire. The details have been managed by a committee consisting of D. W. Cooke, vice-president and traffic manager, chairman, H. C. Hooker, assistant to the president, and H. W. Hawley, division freight agent.

AN ENGLISH FASHION IN AMERICA.—Automobiles are now shipped in coal cars covered with tarpaulins. An automobile manufacturer of Toledo calls attention to his enterprise in thus getting around the scarcity of house cars due to the fact that over 150,000 cars are lying along the Atlantic seaboard and inland as far as Buffalo, Pittsburg, Chattanooga, Atlanta and Mobile, because of the inability of consignees to take their freight. He says that the sight of several of his automobiles, in gondolas or in flat cars, lashed to the car floorings, and covered with heavy tarpaulins, is "daily becoming more common."

The Federal Locomotive Inspection Rules*

Those Which Are General or Have Been Misunderstood Are Clearly Defined and Explained

By Frank McManamy

Chief Inspector of Locomotive Boilers, Interstate Commerce Commission

The locomotive inspection law is comparatively new, and is so comprehensive that explanations will no doubt be of substantial value in assisting carriers to meet the requirements. The locomotive inspection law and rules in no way effect or change any of the requirements of the locomotive boiler inspection law or rules. It is true that the form of reports for monthly and annual inspections were changed somewhat, a combination form covering the entire locomotive, including the boiler, being adopted, but this was done to avoid the necessity of requiring additional sworn reports, and not for the purpose of modifying in any way the boiler inspection requirements.

Boiler Lagging Requirement

While we cannot assume the duty of advising carriers in every case of the expiration of periods allowed by the rules for making various tests and inspections, it is not out of place to direct attention to the fact that the five-year period for the removal of lagging from all boilers which were in service on June 30, 1911, expires on June 30, 1916, and that before that time they must have had at least one removal of lagging and have had the entire exterior of the boiler thoroughly inspected, as provided by Rule 16. On account of having postponed as long as possible any effort to meet this requirement, some carriers are now adopting the practice of simply removing and replacing the jacket and lagging when the locomotive is in for monthly inspection, and so reporting on Form No. 1. This does not meet the requirements, and Form No. 1 cannot properly be used for making such reports. The purpose of requiring a complete removal of lagging is to permit a thorough inspection of the entire exterior of the boiler, which can only be made while the boiler is under pressure; therefore, hydrostatic test must be applied while the lagging is off, and a report made on Form No. 3.

The Locomotive Inspection Rules

In the preparation of the rules which were approved by the Commission in their order of October 11, 1915, effective January 1, 1916, it was considered advisable to follow as closely as practicable the general plan of the locomotive boiler inspection rules, particularly with respect to making inspections and filing reports by the carriers. The purpose of this was to avoid, as far as consistent with a satisfactory compliance with the requirements, inconvenience and expense to carriers in the matter of making reports.

In order to avoid a duplication of reports, combination reports (Forms Nos. 1 and 3) were prepared, which cover the work required by the locomotive boiler inspection law and rules, and also by the amendment to the law and the rules issued in accordance therewith, and take the place of reports (Forms Nos. 1 and 3) previously required and, in general, these reports should be handled the same as the former ones were.

I shall not attempt to explain or define each rule. I will try, however, to make clear those that are somewhat general in their terms, and also any with respect to which numerous questions have been asked.

It will be noted that Rule 1, of the locomotive inspection rules is identical in its requirements with Rule 1 of the boiler inspection rules, and makes the railroad responsible for the general design, construction and maintenance of locomotives and tenders. Rule 2 is identical with Rule 7 of the boiler inspection rules, and makes the officer in charge at each point where inspections are made responsible for the inspection and repair of all locomotives under his jurisdiction. Rule 3 is exactly the same as boiler inspection Rule 8, defining the meaning of the term "Inspector." And they are intended to accomplish the same general results.

Rule 4—Daily Inspections

Rule 4 of the locomotive inspection rules reads as follows:

> Each locomotive and tender shall be inspected after each trip, or day's work, and the defects found reported on an approved form to the proper representative of the company. This form shall show the name of the railroad, the initials and number of the locomotive, the place, date, and time of the inspection, the defects found, and the signature of the employee making the inspection. The report shall be approved by the foreman, with proper written explanation made thereon for defects reported which were not repaired before the locomotive is returned to service. The report shall then be filed in the office of the railroad company at the place where the inspection is made.

The general purpose of this rule is to require the present practice of inspecting locomotives daily to be continued, and to avoid, if possible, the necessity of requiring additional sworn reports of inspection. It is the practice of some carriers immediately to conform to a Government requirement that is less rigid than their present system of inspection, apparently overlooking the fact that Government requirements are not shop standards, or intended to represent the general condition of equipment, but are minimum requirements, or limits which mark the point at which the Government will take action to bring about necessary improvement in the condition of equipment. In other words, they represent the extreme condition in which the locomotive will be permitted to continue in service.

This being true, the effect of fixing by rule a monthly inspection only, would be, in many instances, to have the carriers accept that as the Government standard and neglect inspections between those periods. The law was not intended to relieve carriers from inspections which have by years of experience been found necessary, but to insure the performance of these inspections and such others as may be considered essential to proper maintenance of locomotives. Therefore, Rule 4, providing for the usual daily inspection, in addition to the monthly inspection and report, became necessary.

Fixing Responsibility

Form 2, which is required by Rule 4, was intended to accomplish two definite purposes: First, to insure an inspection of each locomotive at certain prescribed periods. Second, to require the foreman or officer in charge to know the condition of the locomotive, and to say why defects reported were not repaired before the locomotive is returned to service. One of the reasons for this is that in many cases it is practically an impossibility when an accident resulting from defective equipment occurs, to fix the responsibility for the defects in question. The officers in charge of the work will often insist that the defect was not properly reported or not reported at all; therefore, that they should not be held responsible for failure to make repairs. The person whose duty it was to report such defects insists with equal vigor

*From a paper read at the Western Railway Club, Chicago, Tuesday evening, March 22.

that the defect was properly reported, perhaps had been reported numerous times, but had not been repaired. Failure to find the reports of a defect does not always indicate that such reports were not made, because frequently carbon or other copies of such reports are obtainable when the original reports cannot be found.

Rule 4, which requires an inspection after each trip, or day's work, and a report showing the defects found, with the signature of the employee making the inspection, and requiring that the report shall be approved by the foreman, with proper written explanation made thereon for defects reported which were not repaired before the locomotive is returned to service, will assist in definitely fixing the responsibility for operating defective locomotives. It will also require the foreman to exercise more careful supervision over the work, so that he may properly sign the report. These inspection reports must be kept on file in the office of the railroad where they can be checked.

Some railroads are starting out with the evident intention of defeating the purpose of this rule. One of the most common methods is to have two reports, one showing everything in good condition, properly approved by the foreman, which is kept on file; another, which may be the usual work book, or a different report, showing the actual defects and the repairs made.

Railroading has, in a spirit of sarcasm perhaps, been described by a railroad man as "the art of placing the responsibility on the other fellow." I do not agree with this definition, or that it particularly applies to railroad men, because I know that men in other lines of work are as proficient in evading responsibility for improper conditions as some railroad men; but we must admit that it pretty accurately describes practices that are too frequently met with.

One illustration of this is the difficulty we are experiencing in getting Form 2 approved by the foreman, "with proper written explanation made thereon for defects reported which were not repaired before the locomotive is returned to service," as required by the rule. We expected some difficulty in getting the inspections properly made, even though the rule differs but little, if any, from rules which were supposed to be in general use, but we did not expect that it would be more difficult to get the foreman to perform his part of the work than it would be to get a proper inspection made. We were still further surprised to find that the objections of the foremen were not to the approval of the report, as that is a comparatively small matter, but the requirement that "proper explanation must be made thereon for defects reported which were not repaired" appears in many cases to be out of tram with their ideas of the duties of a foreman, and many of them resent being required to say why defects reported were not repaired.

Lack of Supervision

If I were to be asked what in my opinion is the principal cause of locomotives being operated with defects which are violations of the rules, I would without hesitation say that the one important cause is lack of proper supervision. The average workman in any line of work will follow the standard set for him by, and which is acceptable to, the person in charge of the work; or, in other words, they will give you just what you will take. It avails nothing to fix a high standard by rule, and then day after day, on job after job, accept work that is away below the standard thus set. This willingness to accept work that is below the standard, or failure to observe that it is below the standard, has a demoralizing effect on the force and is the principal cause for poor work being turned out.

In one instance a general officer of a railroad asked if there was not some way of being relieved from making out Form 2, stating that the mechanical officers had informed him that they did not understand how they could hold their positions under the new rule which made it necessary to report actual conditions and show a record of the work not performed, with the reason. Upon being asked if the new rules would cause defects on their locomotives, he admitted that they would not. Further questioning brought out the admission that the only effect of this rule would be to require the officer in charge to assume the responsibility for sending locomotives out in a defective condition, and without repairs being made to defects which were reported.

The mechanical officers on the road in question appeared to be perfectly satisfied to have the locomotives continue in service in a defective condition so long as they did not have to sign a report assuming the responsibility by showing that the defective condition had been reported and not repaired, and that the return of the locomotive to service without proper repairs had been approved. When that happened they immediately advised the general officers that under the new rules they did not see how they could hold their positions.

Some of the principal requirements in Rule 4 about which there appears to be some misunderstandings are covered in the following explanatory circular, which was recently issued:

Circular No. 123

In reply to numerous inquiries relative to the inspections after each trip or day's work, as required by Rule 4 in the Commission's order of October 11, 1915, and to provide for a uniform compliance with its requirements, the following explanations are given:

In road service, the word "trip" as used in this rule ordinarily means one way over a division or district. On branch or turn-around runs where one round trip is made in a day, "trip" will be held to mean "round trip."

In suburban, transfer, or short branch line service where more than one round trip is made each day, also in yard service, "day's work" (instead of "trip") will apply.

For locomotives which make one or more round trips per day, with one end of the run a shop point, inspections made daily at such point will be accepted as meeting the requirements of the rule, even though the day's work is not completed there.

In work-train or other service in which locomotives are tied up at outlying points where repairs can not be made, inspection reports may be sent to the terminal at which the locomotive is cared for.

For double-crewed locomotives in yard service, where crews change in the yard, one inspection and report each 24-hour period will be required. This may be made when the locomotive is taken in for fuel, water or fire-cleaning; where such locomotives do not go to the shop for this, an inspection period must be provided, and the inspection as provided by the rule made once each 24 hours.

The above explanations are not intended to reduce the number of inspections required by the rule, which are minimum requirements.

In this connection it is well to say at this time that the explanation of Rule 4 shown on page 41 of the explanations of rules issued by the Special Committee on Relations of Railway Operation to Legislation is one with which we cannot agree. The explanation reads as follows:

"Any employee the railroads designate can sign the report instead of the foreman."

This was issued without having been submitted to any representative of the Government, and cannot be accepted, because it is contrary to the very purpose of the rule, inasmuch as under it a call-boy, roundhouse foreman's clerk, or any other employee could approve reports for repairs of which he knew absolutely nothing.

Who Must Sign Reports

We have stated that at large terminals where the roundhouse foreman or general foreman is unable to approve the reports on account of lack of personal knowledge, the approval of the gang foreman or the mechanic in direct charge of the work would be accepted, because of his having personal knowledge that the work had been properly performed; but we will not accept the report approved by some employee who does not have such knowledge.

The requirements of Rule 4 are identical with the system which has been said to have long been in force on many or practically all important railroads in the country. The instructions shown on the form of report are, in effect, the same as those contained on similar reports which have been in general use. The only difference is that now there is a Federal requirement that these inspections be performed and

the defects reported, and that the foreman shall say why repairs were not made, while prior to January 1, 1916, it was a requirement of the carriers only, and, as was stated by one general manager, "There is a great difference between a Federal rule, which must be observed, and the same rule adopted by a railroad company, which may be varied from at pleasure." Rule 4 and Form 2 simply continue in force what has been said to have long been the general practice with respect to locomotive inspection.

Ash Pan Requirements

Rule 5 cannot, and was not intended to, modify or change the act of May 30, 1908, known as the ash pan act, requiring every locomotive to be equipped with an ash pan which can be dumped and emptied or cleaned without the necessity of an employee going under such locomotive. It was intended to, and does, provide that such ash pans shall be securely and properly attached and supported, and that the operating mechanism shall be properly arranged and maintained in a safe and suitable condition for service. Our inspections have disclosed numerous cases where ash pans are not maintained in accordance with the requirements of the law, the best evidence of which is the fact that it is an easy matter to find some man under a locomotive hoeing out the pan, because the devices for cleaning it are inoperative or inefficient.

Orifice Tests of Air Compressor

Rules 6 to 15 cover the inspection and condition of brake and signal equipment, and provide, first, for an inspection before each trip, to see that the brakes are in a safe and suitable condition for service; second, for a service test to show the general condition of the compressors.

One of the points on which the most numerous requests for information have been received, is the method of making an orifice test of an air compressor, and where the fitting containing the orifice disk should be attached. That is a matter on which we are not going to make a positive rule, because the orifice must be attached at some point where it will receive the supply of air from the compressor. The usual method is to attach it to the main reservoir, which is entirely satisfactory to us. If, for convenience, it is desired to attach it to the brake pipe at the rear of the tender, we will not object, because that is a more severe test than the rules require, inasmuch as the compressor must also supply any brake pipe leakage that may exist.

"Cleaning With Stencil and Paint Brush"

Tests of distributing or control valves, reducing valves, triple valves, straight-air double-check valves, dirt collectors, and brake cylinders are also required at regular intervals; and a choice of three methods of recording the date of these tests is given. That is, it may be stenciled on the parts, stamped on metal tags attached thereto, or displayed on a card under glass in the cab of the locomotive.

The rules so far have not required sworn reports of these tests to be filed, but the practice which we find is being followed on some railroads indicates that such a rule may become necessary, as we have found that the practice which has long been too general on repair tracks, of "cleaning" triple valves and brake cylinders on cars by means of a stencil and paint brush, is being adopted for locomotive practice, and dates of testing and cleaning are being placed in the cab without any work having been performed. In a number of instances the date shown has been one on which the locomotive was not at the terminal at all. This practice, if followed, will surely result in a change of the rule requiring such reports to be sworn to, thus placing a greater measure of responsibility on the inspector and officer in charge.

Clear Vision Windows

Rule 16 covers the condition of cabs, warning signals and sanders, and attempts to provide for a reasonable view of the track and signals for the enginemen. One of the requirements which seems to be not generally understood is that relating to clear vision windows. It may be, perhaps, that the description of this window is not as complete as it might be. The term, however, indicates what is desired, and should in itself prevent the application of some of the windows which were designed to be used under this requirement. I refer particularly to the type of window, supposed to meet this requirement, which has a wooden frame from 1 in. to 2½ in. in width across the front cab window directly in the line of enginemen's vision. This surely could not under any circumstances be called a "clear vision" window. What is desired is not an obstruction, but something that will give an unobstructed view of the track and signals during stormy weather. On the best types the glass is securely attached to a frame at the top and sides only, leaving no obstruction across the center of the window at the bottom of the opening. Such a window will not obstruct the engineman's vision in any way when closed, and in stormy weather, if opened slightly, it will give the engineman an unobstructed view of track and signals, which cannot be obtained with his head out of the side cab window in a severe snow or rain storm.

Times For Tests and Inspections

Misunderstandings with respect to the periods within which the various tests and inspections required by the locomotive inspection rules must be performed have caused some confusion, and are resulting in some instances in carriers making an extra effort to make tests which might properly, and perhaps more satisfactorily, be made at a regular inspection period, and in other instances failing to make tests which should be made at inspection periods, and which will cause additional expense and delay to equipment when they are required later.

To make this point clear, beginning January 1, 1916, which is the date the locomotive inspection rules became effective, all tests or inspections required by them should be made within the prescribed periods. That is, inspections required monthly should be made within the first month; inspections required quarterly should be made within three months; and inspections required annually should be made within the year. This permits inspections required under the locomotive inspection rules to be made at the time the boiler inspections are made, and avoids the necessity of holding locomotives especially for this inspection.

When the locomotive is held for inspection, all of the work should be done; otherwise, it is sure to cause inconvenience later. To illustrate: Hydrostatic test of main reservoirs is required at least once each year. The intent of this clearly was that this test should be made when the hydrostatic test is applied to the boiler, but we are receiving annual reports from many roads showing hydrostatic test applied to the boiler, but none to the main reservoir. This is not only a failure to comply with the intent of the rule, but is sure to result in an inspector ordering the locomotive held to have this work done, and it may occur at a time which will be very inconvenient.

Draw Gear Inspections

There has been some question as to the proper answer to item 6 on Form 1, with reference to the condition of draw gear between locomotive and tender. Rule 22 provides in part that—

> The pins and drawbar shall be removed and carefully examined for defects not less frequently than once in three months.

This has been interpreted by some to mean that the condition need be shown but once in three months, but it simply provides a particular inspection for the pins and drawbar which should be made. The first sentence of the rule requires that—

The draw gear between the locomotive and tender, together with the pins and fastenings, shall be maintained in safe and suitable condition for service.

Which means not only the drawbar and pins, but also the safety bars or chains, with their fastenings; therefore, they must be known to be in good condition, and so reported on each monthly report in answer to item 6. When the drawbar and pins are removed to make the special inspection required by the rule, that should also be indicated on the report. The remaining rules follow, with some slight modifications, the standard practice recommended by the Master Mechanics' Association, which should be so well understood that explanations are not necessary.

Accidents Reported

Up to March 1, accidents reported to us under the locomotive inspection rules had killed 7 and injured 113 persons, and we know that, perhaps on account of failure to fully understand the requirements, all were not reported. Among the most serious, as well as the most frequent, class of accidents are draw gear failures, allowing locomotive and tender to separate, 14 accidents of this character, resulting in two killed and 13 injured, having been reported. Twenty-two persons were injured by defective reversing gear. Broken spring hangers have caused two deaths and six injuries. Cylinder-head failures have killed one and injured six.

A general classification of accidents due to failure of parts of the locomotive and tender covered by the amended law has not been made, but is sure to be surprising. It is our purpose to investigate them carefully, and classify them, giving the cause. After a year or two of such work sufficient data will be available to enable not only the representatives of the Government, but of the railroads, to systematically and effectively labor to remove the causes, and thereby reduce the number.

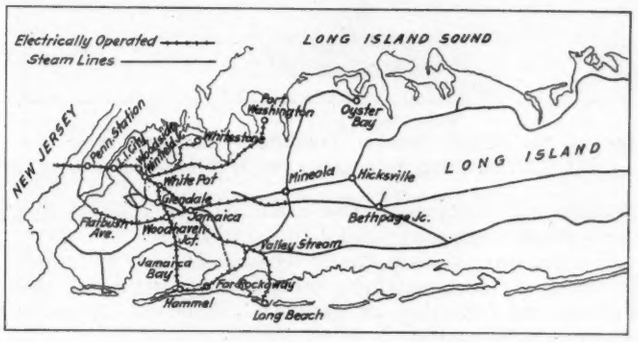
THE RECENT ELECTRICAL TIE-UP ON THE LONG ISLAND

On Wednesday, March 15, the electrified lines of the Long Island suffered a complete tie-up due to the effect of a severe wind and snowstorm on their electric transmission lines. The railroad operates 800 trains a day and about 200 of them were unable to move after the power was lost early Wednesday morning. These trains were stalled at various points on the system until steam locomotives could be despatched to their assistance. The trouble started at 7:50 in the morning and by 10:30 the power on all lines was completely shut off except between the Pennsylvania Station and Jamaica, where some power was available up until two o'clock in the afternoon. The electric service was reinstated about 4:30 p. m.

One of the stalled trains happened to be on the Jamaica Bay trestle when the third-rail went dead and three others were stalled on the Flushing meadows midway between Corona and Flushing on the Northside division for nearly two hours. The train on the Jamaica Bay trestle was finally hauled to the nearest station by a steam locomotive.

Although more severe storms have visited Long Island than the one on Wednesday, notably the recent storm of December 13, 1915, which caused so much trouble on the New York, New Haven & Hartford, this is the first trouble of its kind that has been experienced since the Long Island lines were electrified in 1905. In many respects the trouble on the transmission lines was peculiar in its character. From the result of the high winds and the weight of the half inch covering of ice, the wires whipped up and down in a vertical direction with such force that insulators and tie wires were broken. The peculiar thing about the trouble is that all of the wires were not affected in a similar manner. While those in one span would whip up and down, and around in circles as though they had convulsions, other wires in the same span or in adjacent spans would be almost quiet. At the present time this trouble can only be ascribed to some unusual condition. It was possibly caused by a certain combination of the unequal weights of sleet on the wires and the gusty wind. The whole effect seemed to be one which would result from periodic and forcible lengthening and shortening of the spans.

The unusual stresses set up in the line by this whipping action sheered the tops entirely off of a number of insulators, broke many others and in many instances, caused the cables to tear away from the tie wires which fastened them to the insulators. As the main wires became detached from the insulators, either through the failure of the insulator itself or because of the failure of the tie wire, they dropped to the cross arms. In many instances the wires of the different phases, dropping in this way, came together some place in the span due to the reduced spacing and thus became short-circuited. Where the cross arms were of steel the wires were, of course, grounded when they fell from the insulators. This condition of affairs was prevalent on all feeders scattered over the entire system west of Mineola, particularly on the



The Long Island

main transmission line between Harold avenue and Whitepot. The direction of the winds was a little east of north and it is interesting to note that the direction of the transmission lines most affected was approximately at right angles to the wind or, in other words, from northwest to southeast. The east and west lines were not affected.

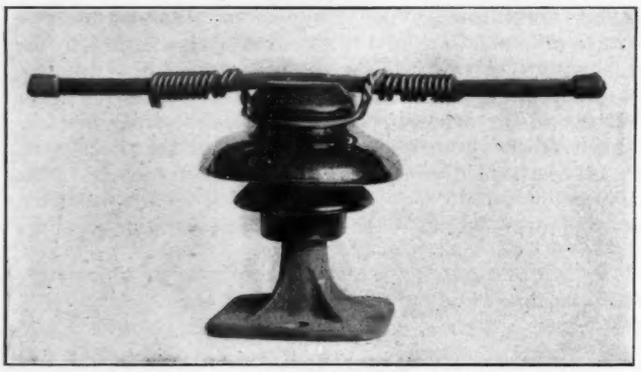
The cables used in the transmission lines were, in all cases, of 250,000 circular mills cross section, and the average span was 150 feet. From Long Island City to Winfield there are eight 3-phase circuits on each steel tower, from there on, each tower carries only six 3-phase circuits. In no case did the ice on these wires reach more than one half inch in thickness.

At 7:50 a. m. the feeders began tripping out one after another with increasing frequency until finally all trunk line feeders were out of service with the exception of the ones feeding Winfield from the Long Island City power house. It was attempted from time to time by cutting out single phases of different feeders to make up one good feeder between the power house and Woodhaven junction. In this way the sub-stations on Atlantic avenue were kept running intermittently for two or three hours. The operation of the Winfield sub-station also enabled fair service to be maintained between Jamaica and the Pennsylvania station until two o'clock in the afternoon. Some trains on the Port Washington branch were also able to move along at a low rate of speed by the current furnished from the Winfield sub-station.

The first trouble was noticed at Woodside junction, which is a short distance southeast of Long Island City, and a little later trouble was reported at Whitepot, about two miles further down the mainline in the same direction. Linemen were immediately sent to these places to make necessary repairs, but by the time they arrived on the scene the trouble had reached such proportions that they could not handle it; it was fortunate that they were at that part of the line when all of the service was cut off as it was then difficult to trans-

port men any place until steam engines could be procured.

When it became evident that so many wires were in trouble that it was impossible to keep a feeder working between the power house at Long Island City and Woodhaven junction, the feeders were killed and all the linemen who could be secured were sent out to repair the trouble as quickly as possible. These men travelled on steam trains, and in many cases hired automobiles were used to reach the points where the wires were known to be in bad condition. Light gasolene and electric emergency cars, which under normal conditions

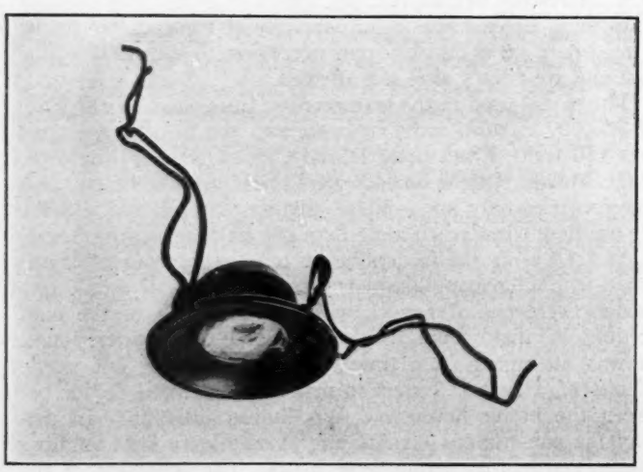


One of the High Tension Insulators Showing How the 250,000 C. M. Cable Is Attached to It By the Tie Line

transport the emergency crews, could not be used at this time because of the sleet and ice on the rails.

At about two o'clock it finally became necessary to cut out the one good feeder remaining between the power house and Winfield and from then on until 4:30 there was no power whatever on the system.

The general plan used in making the repairs to the damaged transmission lines, was to drop men and material along the line from a steam work train, wherever serious trouble was found. This train shuttled back and forth,



One of the Insulators Which Failed During the Storm

transferring the men from one place to another and keeping them supplied with material. By 4:30 in the afternoon the transmission line between Long Island City and Winfield was cleaned up, which allowed electric service to start between Jamaica and Port Washington and Jamaica and Whitestone Landing. By 5:45 p. m. the transmission line between Winfield and Woodhaven Junction was ready for service which allowed electric operation west to Flatbush terminal in Brooklyn, which part of the line was fed from underground feeders, and east to Hempstead where the transmission lines run east and west and were, therefore, not affected. The repair gangs worked until midnight on the transmission line from Rockaway Junction to Valley Stream, and from there to Hammel, which, when finally placed in service, allowed electric trains to operate between Woodhaven or Jamaica and Hammel. The direct route between Woodhaven and Hammel is across Jamaica Bay but this part of the line is on a trestle most of the way and was, therefore, extremely difficult to place in operation. For this reason the indirect route around by Valley Stream was used until the next day. Of course while these repairs were being made to the electric transmission lines, steam locomotives were used to haul as many of the regular trains as possible.

While it is impossible at this time to give a detailed list of all the troubles the following gives some indication of the extreme violence of the whipping action of the wires. Burned and misplaced cross-arms, 11; broken insulators, 30; broken ties, 99; wires burned in two, 1; wires badly burned but not severed, 1.

It is interesting to note that the telephone wires which were in cables were not seriously affected and therefore the various parts of the affected zone were in communication at all times. The signals were out of commission, however, due to the failure of the general power supply and for this reason trains that were moving had to come to a full stop at each block and in many cases difficulty was experienced in starting again. The general situation was also aggravated by the ice on the third rail which caused some trains, when moving along with a limited amount of power, to lose contact at frequent intervals, this latter trouble would probably not have been experienced had the power supply and the number of trains been normal.

OPERATING OFFICERS SHOULD AID TRAFFIC DEPARTMENT*

By M. J. Wise

With the small increase of business within the last few months, we are already experiencing a car shortage. It is not so much the question of want of facilities as it is lack of utilization to the fullest extent of the facilities we have. An increase in carload minima is an important desideratum. If we utilized even 65 per cent of our average available loading capacity, we should have more than enough cars to handle normal business, besides by the decreased number of cars doing away with a large percentage of our congestion at terminals. In 1914 there were 2,304,267 freight cars in the United States, an addition of a little over 600,000 to the number in 1904; or an average number of 60,000 cars yearly has been added to the freight equipment during the past ten years. If the average loading could be increased 15 per cent at one time, it would mean the same as an addition to the equipment of the country of approximately 300,000 cars.

Increasing carload minima may be accomplished in two ways; first, by every railroad carrying on a vigorous campaign with its own employes and shippers to increase the amount of freight loaded in cars; and second, by concert of action between the operating and traffic departments of all lines in raising the carload minima as prescribed by tariffs and classifications. In the Southeastern territory I find that nearly all the minima prescribed by the Southern Classification are from 2,000 lb. to 6,000 lb. less per car than those prescribed by the Official and Western Classifications.

I would recommend, first, that every line member of this Association immediately take active steps to increase the average loading of its cars where the conditions surrounding the traffic make it at all possible, and second, that a committee be appointed to study this important question in all of its details and report to the Association what steps it is advisable to take; not only to forward this movement on railroad lines individually, but also, by co-operation, to secure advances in the minima prescribed by the Classification.

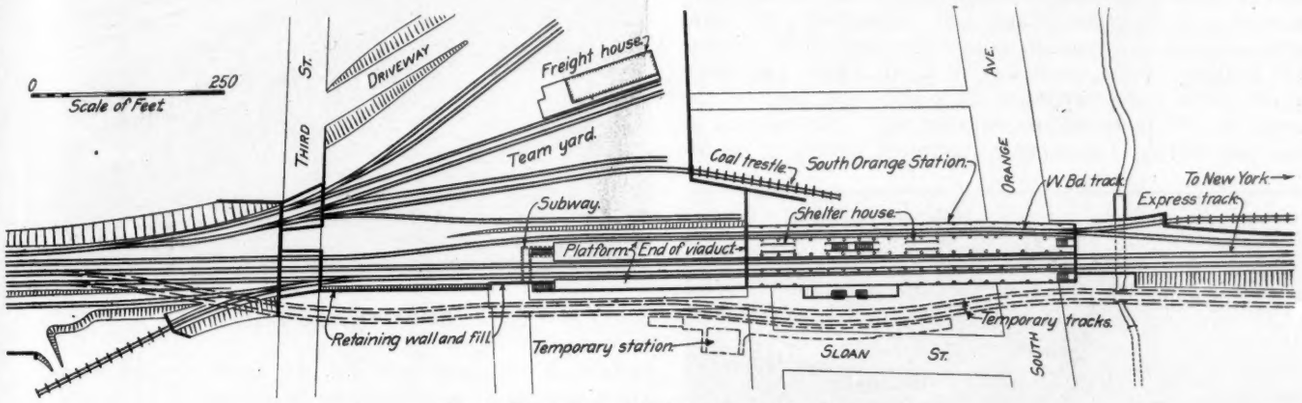
*Extract from an address before the General Managers' Association of the Southeast, Atlanta, Ga., November 11.

Lackawanna Improvements at South Orange

Reinforced Concrete Flat Slab Construction Is Used in a Viaduct for Grade Separation and a New Station

By A. B. Cohen
Concrete Engineer, Delaware, Lackawanna & Western.

The Delaware, Lackawanna & Western in the past few years has made extensive improvements in the elimination of grade crossings and the construction of new stations on the Montclair branch and Morristown line of the Morris & Essex division. These lines are used almost exclusively for suburban service, carrying many thousands of commuters daily between New York City and suburban points in New Jersey within a radius of 30 miles of the metropolis. One of the most recent improvements is through South Orange, where the tracks have been elevated on an earth embankment for a distance of 5,000 ft. Four grade crossings were eliminated and new stations were built at Mountain station and South Orange. The same degree of permanence and architectural beauty that featured the structures on similar improvements at Montclair, Morristown and other points, has been maintained throughout this work.



Track Layout at South Orange Station

South Orange is 15 miles from New York and 6 miles from Newark, N. J. It is at the end of what might be termed the inner zone of suburban traffic. Many trains are made up at South Orange, where a round house and other facilities are provided. The improvement adds a third main or express track which has been in use for a considerable distance beyond South Orange and for part of the inner zone where the grade crossings have been eliminated. This track is operated eastbound in the morning and westbound in the evening, in the direction of the heavy travel. The important feature of the South Orange improvement is a reinforced concrete viaduct of cantilever flat-slab construction, designed to carry heavy locomotive loadings at high speeds, establishing a precedent, in all probability, for this type of construction, in the measure of its carrying capacity. This structure houses the South Orange station and also spans South Orange avenue.

The construction begins at Montrose avenue adjacent to Mountain station, 4,000 ft. east of South Orange station, where the tracks are maintained at their original grade and the avenue is carried overhead on a reinforced concrete arch.

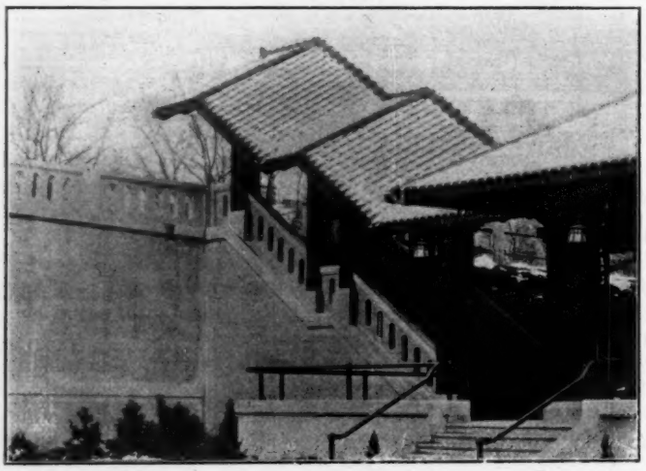
Montrose Avenue Arch and Mountain Station

This arch, which is shown in an accompanying photograph, was advantageously combined with the station layout by stairways to connect the station south of the tracks, with the shelter house north of them, thus furnishing a means for crossing the tracks and eliminating the usual subway construction. The bridge spans three tracks spaced 13 ft. center to center and two platforms 11 ft. 9½ in. in width, making a clear span of 60 ft. The arch is surmounted by an

ornamental railing which is continued down the stairways leading to the station. The tile covered canopies over the concrete stairways are a continuation of the station and the shelter house roofs. The treatment combines the two structures and makes the arch an integral part of the station layout.

At a point 1,000 ft. west of Mountain station, the new tracks begin to ascend on a grade of 0.3 per cent, leaving the old tracks which were on a descending grade of approximately the same rate. This grade is continued to the easterly end of the viaduct at South Orange avenue, where it intersects a 0.25 per cent descending grade that extends across the structure. The latter grade is then increased to 1 per cent and joins the old tracks about one-half mile beyond the viaduct.

The elevation of tracks eliminated two other grade crossings besides that at South Orange avenue, i. e., Mead street, midway between Mountain station and South Orange, and Third street just west of the viaduct. It was necessary to depress these streets 7 and 4 ft. respectively, to obtain sufficient vertical clearance to construct reinforced concrete slab bridges. Both streets are 50 ft. in width, permitting of two 24-ft. spans supported along the center lines of the streets on 2-ft. piers with arched openings. The columns of each pier rest on a continuous reinforced footing of an inverted T-beam shape, the stem of which projects 6 in. above the crown of the road to form a curb and protection for the columns. The slab supporting the tracks has a depth of 3 ft. at the center of each span and the top has a pitch of 3 in. from the center of the pier to either abutment for drainage.



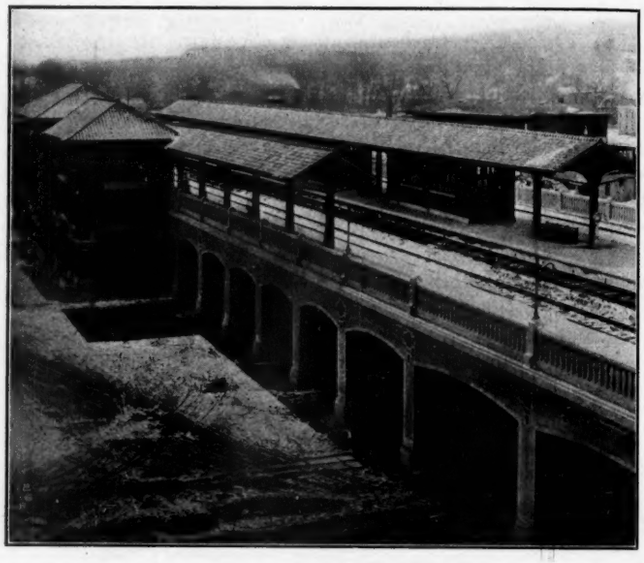
Architectural Treatment of Stairways at Mountain Station

The Mead street bridge is a right-angle crossing, carrying three tracks and is 46 ft. wide. At Third street the construction consists of two separate bridges, 26 ft. apart. One supports the three main tracks similar to Mead street, while the other supports the tracks to the freight yards, as shown on the map.

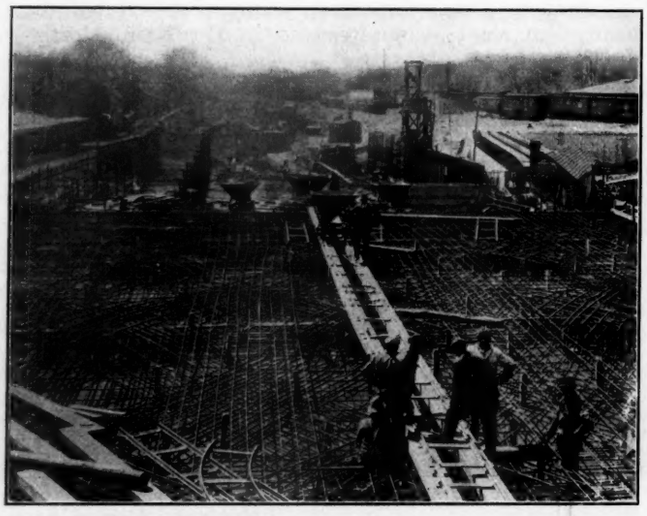
The South Orange Viaduct

Owing to the exorbitant price wanted for property needed for the expansion of tracks and station facilities, it was decided to place the station under the tracks. The problem was solved economically by the construction of a reinforced concrete viaduct of cantilever flat-slab construction, 79 ft. wide and 426 ft. long, under which the station and all its appurtenances were built within the confines of the original right-of-way. The easterly end of the viaduct spans South Orange avenue, the main thoroughfare of the village. Other facilities provided under cover of the slab are, a concourse connecting the station with South Orange avenue, carriage space and a heating plant.

The reinforced concrete flat slab system carrying railroad loading was first used in the construction of the Soo Line terminal at Chicago and the satisfactory results obtained there prompted its adoption; first, for the construction of a viaduct, 150 ft. wide and 1,000 ft. long in the new Lackawanna terminal improvements now under construction at Buffalo, N. Y., and later for the South Orange viaduct. There are many advantages to be gained by this type of construction, aside from considerations of economy. It permits of effective architectural treatment, has a very shallow floor depth and like other slab construction it has no girders projecting above the deck to encroach upon the lateral clearances, or interfere, as in this case, with the construction of the platforms. The unbroken surface of the deck lends itself also to simple water-proofing treatments. The rigidity of the construction is noteworthy; two heavy locomotives passing over the structure at high speed, produce no noticeable vibration and rumbling noises, common to structural steel bridges, are very much subdued.



South Orange Station



Flat Slab Reinforcement, South Orange Viaduct

In addition to the three tracks, the viaduct carries an eastbound platform 15 ft. 4½ in. wide and a 25-ft. island

platform between the middle or express track and the westbound local track. The 25-ft. width was fixed by clearance requirements on either side of the shelter houses built on this platform. The over-all width of the viaduct is 79 ft. for the portion extending from the west abutment to the westerly line of South Orange avenue at which point it was necessary to reduce the width of the structure to avoid the necessity of purchasing property on the east side of the avenue north of the viaduct. The width at the east abutment is 74 ft. 5 in.

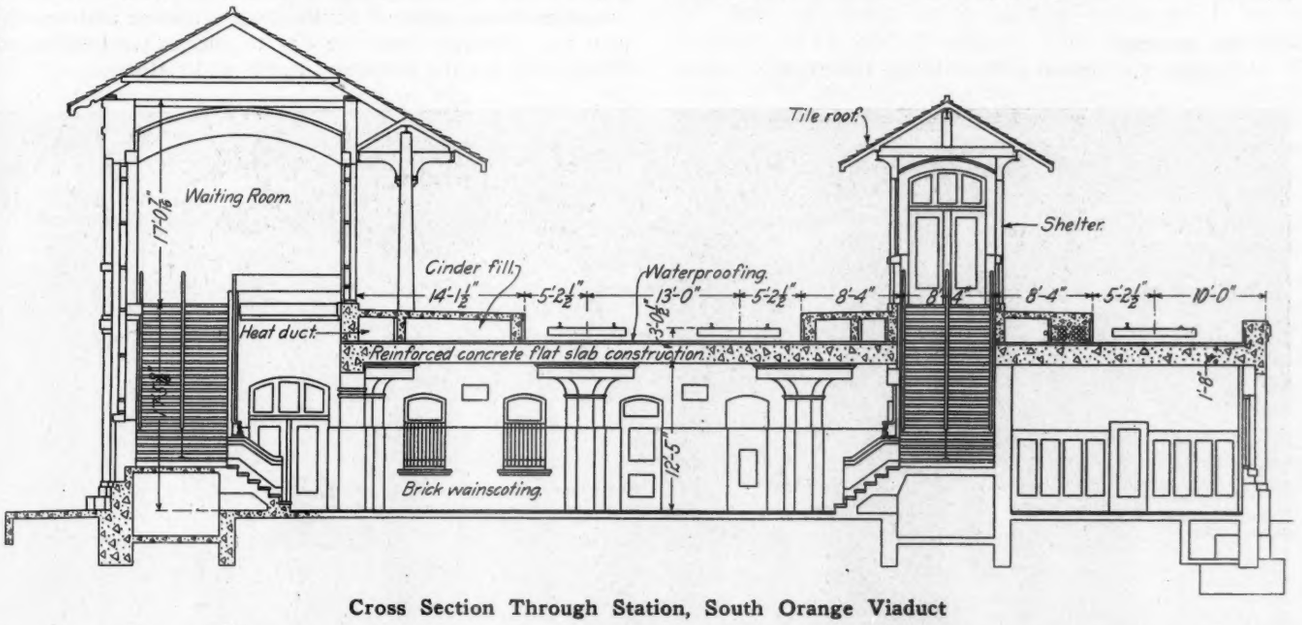
The transverse spacing of the columns, except at the narrowed end, is 18 ft. 9 in. center to center. This spacing is more economical than a 25-ft. spacing of a four-column bent. It also permits of the location of the island platform in the center of the second bay, so that the openings in the slab for stairways do not interfere with the direct bands of the reinforcing steel over the columns, at the same time giving a better distribution of the track loads.

Longitudinally the columns are spaced 20 ft. center to center from the west line of the avenue to the west abutment. At the avenue a change of the spacing of the columns was made necessary, owing to the width of the roadway and the angle of 81 deg. 40 min. that it makes with the center line of the express track. The length of the skew panels over the street is 30 ft. Since the remainder of the bents are at right angles to the center line of the express track, the panels adjacent to the roadway spans are of irregular dimensions. The east abutment span was made 23 ft. to permit of the location of the stairway openings that would not interfere with the reinforcing steel over the last row of columns. The columns for the typical 18 ft. 9 in. by 20 ft. panels are 34 in. in diameter. The columns along the curb line are 36 in. while those in the center of the roadway are 40 in. in diameter. The slab is 20 in. thick for the typical panel and is increased to 26 in. for the roadway span.

An effort was made to produce architectural effects in planning the viaduct and station. The type of railing used on the various bridges of this improvement and shown in the accompanying photographs, had its inception in the design of the viaduct and surmounts the entire structure. At both the north and south faces of the viaduct, half-round columns were completed by pilasters which were joined by flat segmental arches. Colored matt-glazed tile panels were inserted at the head of each pilaster and the exterior surfaces, as well as the interior columns, were bush-hammered as a relief from the otherwise plain concrete.

It was at first planned to build the station and shelter houses on the upper level of concrete, but it was later decided to substitute the dark red wire-cut brick which produced so pleasing a contrast with the concrete at Mountain station. The brick, trimmed with concrete-stone, was laid in "double stretcher flemish bond," the double stretchers not being separated by mortar joints. The station interior was finished in plaster above a buff colored brick wainscoting, the plaster ceiling being applied directly to the concrete slab which had previously been coated with a binder of bituminous paint and sand. The baggage room, ticket office, lobby and other waiting room facilities are on the street level. Two sets of stairways lead from the lobby to the track level; one stairway to a waiting room on the eastbound side and the other to the island platform on which are two shelter houses. The platform canopies are built of structural steel with concrete roof slabs covered with the green tile.

The station and shelter houses are heated and ventilated by a hot-blast system, the heating plant being located on the south side of the viaduct adjacent to the west abutment, occupying the area of two panels. Part of this space is used as a coal bin which can be filled from hopper bottom cars by a chute through the abutment on the center line of the westbound track. The remainder of the space is devoted to the boiler and fan rooms. The boiler room floor is five feet below the street level and the fan is located above the boiler on a mezzanine floor. Reinforced concrete pipes were used for the ducts to carry the hot air underground to the station. A separate duct is carried through the slab and under the platforms to heat the shelter houses. A flue in the abutment leads to a chimney built on top of the wing wall retaining the approach fill.



Cross Section Through Station, South Orange Viaduct

Design

The cantilever flat slab system (patents for which are controlled by the Concrete Steel Products Company, Chicago) consists of a four-way reinforcement for the slab. Approximately one-half of the rods of each band are bent up and lapped over the column capitals to provide reinforcement for negative bending moment at these points. The effective depth at the columns is increased by drop panels which also serve to reduce the shearing stresses.

The structure was designed to carry two 233-ton Mikado

engines with drivers 5-ft. 6-in. center to center, 60,000-lb. axle loads, on each of the three tracks, with a live load impact factor of 68 per cent. of the static live load proportioned according to the following formula: Impact $= \frac{LL \times LL}{LL + DL}$. The maximum negative and positive live load moments were determined by the theorem of three moments, for wheel concentrations of the two engines followed by a train load of 6,000 lb. perX lin. ft. of track over seven panels for both the irregular spans over the avenue and the 18-ft. 9-in. x 20 ft. 0-in. typical panels. For maximum moments all three tracks were considered loaded. In addition to the longitudinal continuity of the slab over the columns, there is a transverse continuity. However, the moments that were computed in the longitudinal direction were distributed transversely in accordance with the method of computing simple beam reactions and the impact factor determined by the formula mentioned above. Owing to the considerable amount of fixedness at the columns and the transverse continuity, 12/15 of the computed moment was used, thus giving end moments equivalent to $\frac{wL^2}{15}$ for determining the amount of steel required over the columns.

Following the method of calculating the negative moment over the columns, the slab at the center of the panel was proportioned for the maximum positive moment, reduced in the same ratio as was the negative moment. The reinforcement required was then distributed among the direct and diagonal bands in accordance with the co-efficients of 1/40 and 1/60 respectively, or a ratio of 3 to 2, as established by the Chicago building code.

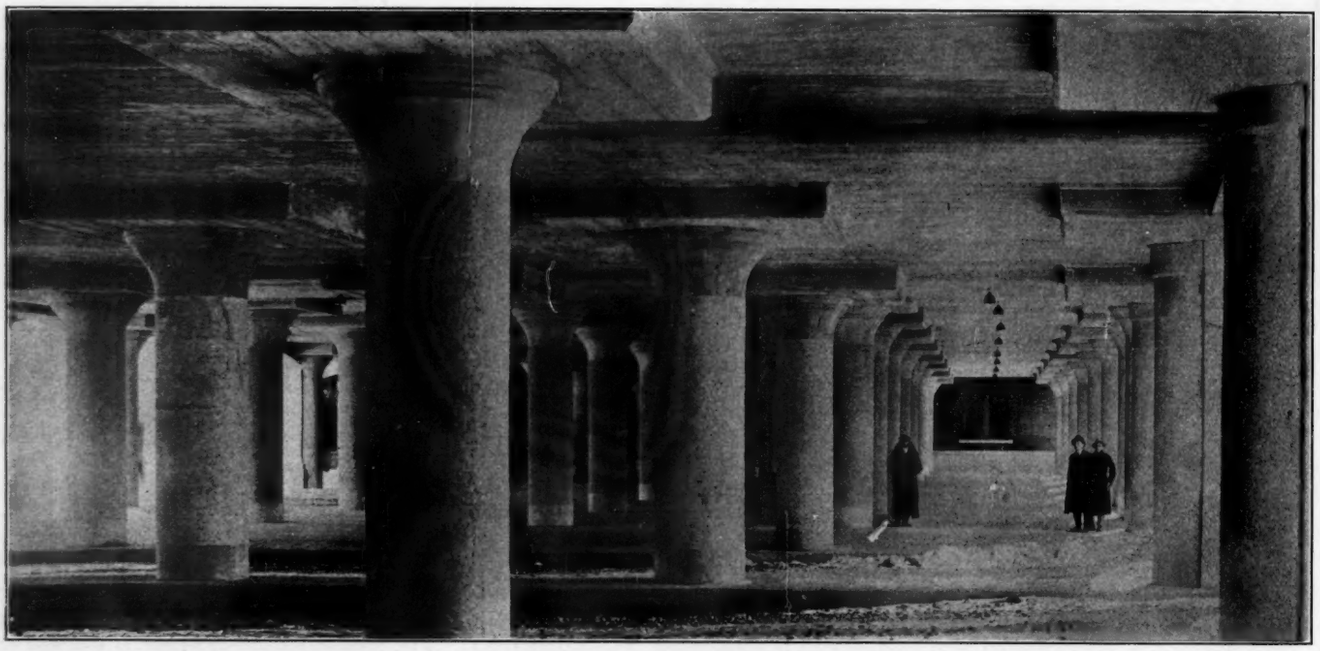
The columns were designed as hooped columns, with both spiral and vertical reinforcement to take the maximum reactions due to the conditions of loading as heretofore described. The footings of the two columns of each bent under the west bound track, are connected throughout by reinforced concrete ties to insure a more uniform distribution of the load on these footings. The footings are designed for a soil pressure of three tons per square foot on a good gravel subsoil, about five feet below the surface of the ground.

The unit stresses used in the design of this work were 650 lb. per sq. in. for extreme fiber compression in the concrete, 16,000 lb. per sq. in. for tension in the steel, and 500 lb. per sq. in. for concrete columns exclusive of the steel reinforcement.

The structure, 426 ft. long, has no expansion joints. The slab is reinforced for stresses from temperature variations, by bands of reinforcing steel between each row of columns, both longitudianally and transversely. There are ten ¾-in. rounds in each longitudinal band and seven in each transverse band, spaced uniformly between the drop panels and placed in the upper plane of the slab. The bars of the four-way reinforcement, that are not bent up over the columns to resist the negative moment, are lapped to furnish continuous reinforcement which provides additional resistance to temperature changes. Additional temperature bars are placed around the stairway openings to bring the resistance of the reduced section to the same tensile strength as that of the full section.

Construction

As the entire improvement was along the old alignment, it was necessary to shift the tracks, as shown in the accompanying map to avoid delays to traffic. Property was leased where necessary, east of South Orange avenue and permission was obtained from the city to encroach somewhat on Sloan street for the temporary tracks and station.



View of Viaduct from the Underside

In constructing the footings for the columns, stubs or dowels projecting the required length, were imbedded to correspond to the vertical rods of the column reinforcement. The latter, including the spirals, were set in place and securely fastened to the stubs after which the falsework for the slab were erected. Sheet metal forms were used for the columns which were poured to an elevation about two inches above the underside of the drop-panels. The columns were allowed to attain an initial set before the slab was poured.

The bent-up bars of the slab reinforcement over the columns were held in place on a one-inch bar, circumferential around the edge of the drop panel in the upper plane, firmly supported by precast 4-in. by 4-in. concrete posts.

The slab was poured in three sections for the full width of the viaduct. To avoid construction joints in the slab through any part of the station, the last section was made 210 ft. long, covering 10½ panels and required 1,110 cu. yd. of

concrete. This was the largest amount poured in a continuous operation.

Two mixtures were used to complete the work, one, a ¾-cu. yd. mixer, was stationary on the approach fill adjacent to the east abutment and the other of ½-cu. yd. capacity, mounted on a flat car, was moved ahead of the centering as the work progressed. For this purpose the old tracks approximately along the center line of the structure were not removed west of South Orange avenue until the structure was completed, and a connection was maintained with the temporary tracks during construction. The concrete was distributed from the mixers by buggies mounted on tracks raised above the level of the top of the slab. The tracks can be seen in one of the photographs.

In the construction of the stairs the concrete was first poured to within 2½ in. of the finished surface to allow for a concrete safety tread of that thickness. Alumdum, a mineral compound, was mixed with the concrete of the tread to form the resistive surface.

All abutments and retaining walls on this improvement were built in alternate sections not exceeding 30 ft. in length. Each section was poured in a continuous operation from the top of the footing to the underside of the coping to eliminate the usual unsightly horizontal joints where efflorescence is most likely to occur.

The entire area of the slab was waterproofed with three plies of Minwax saturated cloth laid in Minwax hard waterproofing, applied hot. The membrane under the platforms was protected by a 1½-in. layer of concrete, upon which the curbs and platforms supported on cinder fill were built. Under the tracks, the membrane was protected by two ¾-in. layers of asphaltic mastic mixed with torpedo washed gravel furnished by the Johns-Manville Company. The mastic was carried up the sides of the curb to form a trough.

Hyde, McFarlin & Burke, New York City, had the general contract for the improvement. The station, however, was built under separate contract by F. D. Hyde, of the same company. The design and construction of the South Orange improvement was carried out under the general direction of G. J. Ray, chief engineer of the Lackawanna. The station design and aesthetic features of the work were directed by F. J. Nies, company architect. G. T. Hand, division engineer, supervised the construction with W. H. Spiers, resident engineer, in immediate charge. The reinforced concrete design was directed by the writer, with the design of the flat slab construction, subject to the approval of the Concrete Steel Products Company.

CAMPAIGN TO INCREASE CAR LOADING ON THE CHICAGO & NORTH WESTERN

For the past two years the Chicago & North Western has been engaged in a systematic campaign to bring about a more efficient use of its equipment by securing heavier loading of its freight cars.

For several years the management has been making an effort to impress upon agents the importance of heavier loading of cars and general instructions have been issued, with the result that the car loading has been progressively increased, but the best results were not obtained until a systematic campaign of education and supervision was inaugurated under the direction of the vice-president in charge of operation. During the past two years, however, the efforts in this direction have been attended with such successful results that an examination of the methods that have been pursued is of special interest at this time when the country is experiencing a car shortage, the largest ever reported for this period of the year since 1907.

As the loading of carload freight is done by the shipper and is not under the direct control of the railroads this campaign has necessarily consisted mainly of work among the shippers. In explaining to them the advantages of utilizing the full capacity of freight equipment, not only from the standpoint of the railroads, but from the standpoint of the shippers and consignees themselves, during the past two years the superintendents, trainmasters and traveling agents of the traffic department of the North Western have personally visited every shipper on the line of the road. Moreover, this work has been backed up by constant and thorough supervision on the part of the operating department officials, and by a willingness to co-operate with the shippers in securing the desired results. In case a shipper overloads a car inadvertently he is not penalized, but the railroad assumes the cost of transferring the load.

At the outset the company was confronted with the fact that the minimum carload weight as prescribed in the tariffs, and in many cases fixed by orders of the federal or the state commissions, are very much below the capacity of the cars, and that many shippers are inclined to order at one time only a sufficient quantity to give them the benefit of the minimum carload freight rate, in order to reduce their investment in stock carried or for other reasons. This condition has been met, however, by showing the shippers and consignees the benefit to themselves in addition to the benefit to the railroads, which would be derived from handling shipments in as large quantities as possible, and increasing the efficiency of the available equipment, thus lessening the liability of a car shortage, and by avoiding the inconveniences, loss of business, or even more serious consequences attendant upon inability to receive desired shipments promptly in times of car shortage or of severe weather.

For the purpose of ascertaining specific cases of light loading of equipment in order that they might be brought to the attention of the railroad officials and the shippers, a man was stationed in the freight auditor's office, reporting to the vice-president's office to check over all waybills. For this purpose a man was employed who had formerly been a yard clerk and who was therefore familiar with the capacity of cars and the conditions affecting the loading of commodities. This man receives all waybills and when he finds an instance in which a car has been loaded to very much less than its full capacity he checks off the information called for by the following blank:

Division.

Car	Date	Waybill
Contents	Shipper	
From	To	
Capacity	Wt. of Contents	Lbs. Underloaded

He checks especially the billing from coal loading docks, elevators, etc., and tries to secure evidence of several cars from one consignor to one consignee. The blank is then sent to the agent at the point of shipment with instructions to call on the shipper and bring the matter to his attention. In the case of shipments of several cars from one consignor to one consignee he is given information as to how many more cars were used than would have been necessary if they had been loaded to capacity. The agent explains in detail the advantages on both sides of loading cars to capacity and urges the shipper to order in carload lots whenever possible. If he is informed that the tonnage was specified by the consignee the information is sent to the agent at the point of destination, who calls on the consignee.

The agents are instructed to bring to the attention of shippers at every opportunity the advantages of capacity loading and to make every effort in their power to secure heavier loading.

Detailed instructions on this point were issued in a circular to agents dated December 19, 1914, signed by the

general superintendents of the lines west of the Missouri river, of the lines east of the Missouri river, and of the Minnesota and Dakota divisions. This circular pointed out that examination of waybills in the auditor's office at Chicago, and of the billing of cars passing through large terminals had shown that agents either did not understand clearly the necessity for having cars loaded to capacity, and for the correct billing of carload freight, or were neglecting to carry out instructions that had been issued from time to time. The agents were instructed to show in a place provided on the billing, (1), the marked capacity of the car; (2), the light weight of the car; (3), the weight of the car and contents; to obtain the light weight and capacity of the car from the car itself without guessing at either of these figures, and to obtain from the shipper the correct weight of the contents where that information is available, and bill it accordingly. If the actual weight was not available they were instructed to obtain the estimated weight and impress upon shippers the necessity of giving this information as nearly correct as possible, and to show the information correctly under heading No. 3 on the waybill. Other instructions to agents in this circular were as follows:

"Keep before shippers all the time the necessity for loading cars to 10 per cent above capacity with commodities that can be so loaded, and as nearly to capacity as possible all other commodities, the nature of which will not permit of their being loaded to capacity.

"Inspect the cars so that you will actually know whether or not the shippers are complying with your request to load cars to their capacity.

"Impress upon all dealers in coal, lumber and other similar commodities the assistance they can give to the railroads by ordering carloads instead of limiting the amount, and which will avoid the necessity for the railroad hauling partially loaded cars over long distances.

"Where you find that shippers are not loading cars to their capacity or 10 per cent above, and not trying to comply with your request, try to explain to them its importance and that it means—

(a) That a great many less cars are required where they are loaded to capacity.
(b) It lessens the liability of a car shortage.
(c) It increases the earnings per car to the railroad without increasing the cost to the shipper.
(d) Reduces empty car mileage, which is a dead loss to the railroad.

"You are being furnished with actual weights of grain, and you should not lose the opportunity to call to the attention of the shipper every case of where the return weights show that there was not loaded in the car the amount as called for on his bill of lading.

"Keep in mind, yourself, and see that it is thoroughly understood by your subordinates, that there is no way in which greater assistance can be rendered to the company at this time than by securing a full load for every car and showing the correct information under Heading No. 3."

Each month a statement is compiled of the number of cars of freight originated at each station, and the average loading in tons by commodities for all carload freight. This statement is compiled by divisions and shows the comparative loading of different commodities on the different divisions, and also the average haul, and is used to show the division superintendent what loading is being made on other divisions. Similar statements are also compiled for each division showing the loading at each station, and are used by the superintendents to call to the attention of the agents the loading that other agents are able to obtain. If one station shows lighter average loading than another on a certain commodity the agent uses this information in taking the matter up with shippers or consignees.

In many cases the agents found consignees entirely willing to co-operate with the railroad by loading cars to capacity. In a great many cases the consignee stated that he had ordered a carload and the shipper had sent less than a carload; for no apparent reason, except that no especial effort had been made to load the car as heavily as possible. In such cases the matter was taken up with the shipper and he was requested to make a greater effort to load the cars fully. In many cases manufacturing plants which had been in the habit of ordering a minimum carload of supplies and materials at a time, were glad to specify heavier loading when the subject was brought to their attention. Coal dealers who had ordered less than a carload of coal were asked if they would not in the future order by carloads. In some cases retail dealers did not wish to order in such large quantities because they had not sufficient storage accommodations, but when they were told that if they would order full tonnage early in the fall they would be assured of a supply during bad weather without taking the risk of being left without a supply when it was needed, on account of bad weather or car shortage, many dealers were willing to increase their facilities in order to purchase in carload lots. Much good was accomplished by large coal dealers on the line by issuing bulletins to their retailers, pointing out the advantages of ordering a car at a time. The general office took up the matter with the larger shippers and very readily secured their co-operation, as doing a business in carload lots means handling larger sales on each transaction, thereby reducing the overhead expense as well as a reduction in switching charges, and in many cases they were able to secure the co-operation of the retailer where the railroad could not.

The large shippers and wholesalers, as well as the railroad officers, were able to point out to the retailers that when a dealer orders less than a carload at a time the car in which it is hauled is only partially loaded, but its movement and delivery involves practically the same expense to all concerned as if it were loaded to capacity, and that in the time of car shortage or severe weather if the retailer finds his supply short he is liable to blame the railroad for not delivering shipments promptly; whereas, ordering in larger quantities would reduce the number of cars required, and thus the danger of a shortage, thus saving inconvenience and expense to all concerned.

Various trade associations have also rendered valuable co-operation by circularizing their members and urging upon them the importance of capacity loading. The lumber dealers have done a great deal of work of this kind. The matter has also been brought to the attention of trade papers that have presented the subject to their readers in an effective way.

The scarcity of cars which has prevailed throughout the western states for some time has also given the railroad officials a new opportunity to impress upon shippers most effectively the importance of the utmost co-operation to obtain the most efficient use of the available car supply. Concrete instances with detailed information of cases in which cars have not been fully loaded were brought to the attention of the various state railway commissions and they have issued circulars to shippers urging them to load cars up to 10 per cent above their marked capacity. Circulars of this kind, which have been noted in our news columns from time to time, have been issued recently by the Railroad and Warehouse Commission of Minnesota, the Board of Railroad Commissioners of Iowa, the Public Utilities Commission of Illinois, and the Nebraska State Railway Commission.

For example, the Nebraska commission said in its circular: "The underloading of cars by shippers contributes materially to car shortage conditions. During a recent period the movement of 203 cars of grain disclosed that 143 cars would have carried the whole shipment if loading had been made to full capacity. Here was an unnecessary loss of the service of 60 cars. Shippers could greatly aid in this time of stringency

by not specifying size of car when ordering, and loading cars furnished to full capacity."

The Illinois commission said in its circular: "During a recent period 155 cars were used to load a certain quantity of grain that could have been loaded in 110 cars, indicating the use of 45 unnecessary cars which could have been given to other shippers, and it shows an unnecessary loss both to the railroads and to the shippers of 45 cars. Shippers can assist materially by not specifying the size of car when ordering unless required to fill some specific order, and by loading the cars to 10 per cent above their marked capacity. . . . If complaints are made by shippers of failure to secure equipment, the fact as to whether cars furnished have been loaded to capacity or not will be taken into consideration."

As the conditions affecting the loading of various commodities vary, and as the character of the freight handled in the larger quantities on different railroads varies greatly, comparisons of the average loading of different railroads do not show the true conditions unless consideration is given to the varying character of the traffic. A railroad which has a preponderance of high-class merchandise freight would naturally show a lighter loading than a road whose traffic was composed more extensively of heavier loading commodities, and the average loading of a road which has a large amount of livestock traffic, like the North Western, will be brought down by the fact that the livestock loading is necessarily light and cannot be materially increased. Therefore, any improvement which a railroad has made in its car loading can best be illustrated by a comparison of its own records. An illustration of the results of the North Western campaign during the past two years is shown by the following comparison of the average loading per car on some of its principal commodities for 1913 and for 1915:

Name of Commodity	1913	1915
Grain	32.3 tons	35 tons
Other products of agriculture	17.7 tons	18 tons
Products of animals	11.3 tons	11.3 tons
Anthracite coal	34.5 tons	35.1 tons
Bituminous coal	36.9 tons	37.6 tons
Coke, iron ore, sand, salt, and other products of mines other than coal	45 tons	46.3 tons
Lumber	23.6 tons	23.9 tons
Pulp wood	31.5 tons	32.7 tons
Logs	31.8 tons	35.3 tons
Other products of forest	23.3 tons	24 tons

As compared with 1910 the average loading of some of the principal commodities handled by the North Western had increased in 1915, as follows: Grain, 2.3 tons; other products of agriculture, 1.5; anthracite coal, 3.8; bituminous coal, 3.5; stone, sand, salt and other products of mines other than coal, 3; lumber, 2; pulp wood, 4.4; logs, 4.7; all carload freight, 1.4 tons.

Comparing the average loading at the time of the heaviest traffic, the month of November, 1907, and November, 1915, there was an increase in the average loading per car of 4.3 tons, or 22.8 per cent, in spite of the fact that the month of November is a time of heavy merchandise movement.

For the five months ending November 30, 1915, the average loading on some of the principal commodities loaded on the line of the North Western was as follows: Wheat, 38.8 tons; flour, 22 tons; corn, 36.7 tons; oats, 30.3 tons; barley, 35.4 tons; anthracite coal, 35.3; lumber, 24.3; pulp wood, 34; cement, 31.5; total grain, 34.8; total products of animals, 10.9; total products of mines, 45.5; total products of forests, 27.7; manufactured and miscellaneous, 22.6; products of agriculture, 26.8.

On the Minnesota and Dakota divisions, the two heaviest divisions for wheat, the average loading on wheat originated by the North Western, was 40 tons to the car during the month of December, as compared with an average of 39 for the system. On barley the average loading on the Dakota division was 37 tons, as compared with an average of 35.4; on flour, the loading on the heaviest division was 23 tons, as compared with an average of 22 tons. These figures show how the loading at points where commodities are handled in small lots brings down the averages. The North Western also handles a large amount of livestock, packinghouse products, merchandise and fruit which do not lend themselves readily to heavy loading and which tend to keep down the average figures.

VIGOROUS MEASURES WITH FREIGHT BLOCKADE

Following the action of the American Railway Association the first of this month, and the conference at the office of the Interstate Commerce Commission in Washington, March 6 and 7, the presidents of the roads terminating at the North Atlantic seaboard, in conference with members of the Interstate Commerce Commission, at New York City, March 17, decided to appoint a permanent committee to deal with the general subject of freight congestion, this committee to consist of six railroad presidents and one member of the Interstate Commerce Commission, E. E. Clark. This committee for the present will sit every week, and oftener, as may be necessary. The roads represented at the conference on the 17th were: Baltimore & Ohio; Boston & Maine; Central of New Jersey; Delaware & Hudson; Delaware, Lackawanna & Western; Erie; Lehigh & Hudson River; Lehigh Valley; Long Island; New York Central; New York, New Haven & Hartford; New York, Ontario & Western; Pennsylvania; Philadelphia & Reading, and Western Maryland.

The permanent committee, called the executive committee, consists of Messrs. E. E. Clark, A. H. Smith (N. Y. C.), Samuel Rea (Pennsylvania), F. D. Underwood (Erie), Howard Elliott (N. Y. N. H. & H.), W. G. Besler (Central of New Jersey) and Daniel Willard (B. & O.). This committee has appointed a committee of traffic and operating officers, with B. Campbell (N. Y. N. H. & H.), chairman, to deal with detail operations.

The resolution under which the executive committee will act reads in substance as follows:

"The committee is appointed to handle and direct embargoes, and deal with demurrage and storage rules, to the end that the present freight accumulation may be relieved and cars released and returned to points in the country required for loading. The executive committee will pass on and approve or disapprove or modify all embargoes. They will make such investigation as may, in their opinion, be advisable and they will have power and authority to order the stoppage of shipments to individuals or companies, if they find such consignees are not taking promptly shipments consigned to them, and are tying up equipment and blocking facilities of traffic unduly.

"The necessity of prompt release of equipment and track facilities is admitted and required for the general good, and the committee will, in order to expedite the movement of cars and to obtain the maximum use of facilities, tracks, cars and warehouses for the good of all, apply the principle of storage charges for the use of those facilities as distinctive from transportation charges as follows:

"First: The track storage charge.

"Second: The warehouse storage charge.

"Third: The car storage or demurrage charge.

"The committee in passing measures of relief shall consider those principles in issuing rules and regulations.

"The committee may call upon individual railroads to co-operate with facilities and otherwise, as may be considered possible and practicable. And it is understood that the individual railroads, parties to this agreement, will render and provide all possible assistance to the general good. These measures to be in effect until normal conditions are restored.

"The committee ask the co-operation of all shippers, consignees, and receivers of freight in this endeavor, and that

they attend and assist on request in any investigation of conditions locally or generally."

The Executive Committee meets at the Grand Central Terminal, 45th street, New York City.

The Interstate Commerce Commission has ordered all railroads to file promptly at Washington copies of all embargo notices and all rules and regulations governing the conduct of business in this respect, including the distribution of cars.

The National Industrial Traffic League has agreed with the railroads' committee, as outlined last week, page 517, in recommending that the commission approve the applications of the principal roads for authority to increase the demurrage on freight cars, after two days' free time and three days at one dollar a day, to two dollars a day; and also for authority to make changes in the average agreement. An early favorable decision is expected from the commission.

The New York, New Haven & Hartford reported at the conference that severe congestion of freight continues throughout a large part of the territory served by its lines. At the beginning of this week there were about 49,000 loaded cars awaiting delivery, and an estimated 18,000 cars held on other roads (west of the Hudson River), destined for the New Haven.

Numerous manufacturers continue to use automobile trucks for transporting merchandise long distances. Shippers in Bridgeport, Conn., have sent freight to New York City by taking it across the sound to Port Jefferson, N. Y., and sending it thence by the Long Island Railroad. Three firms in a New England city, anticipating a strike in the coal mines, are said to have bought 285 cars of coal when they are not able to unload more than three cars a day. Dry goods jobbers in New York City report that some small manufacturers in that line have had to close their factories because of inability to ship goods and to collect pay for them.

The New York, New Haven & Hartford on Thursday, March 16, found it necessary to put an embargo on all shipments of freight to Pier 39, East River, New York City, and on all shipments to go by the boats of the New England Steamship Company to ports on Long Island Sound. The streets of New York have been so slippery that horses have been able to draw only about half the usual load, and delivery of freight by lighters in the harbor has also been very slow; and these conditions have resulted in about 2,000 loaded cars being on hand for delivery at New York harbor points.

Large quantities of cotton for New England are being held at New York because of the refusal of the New England carriers to take the goods; and, according to the Journal of Commerce, the total is 35,000 bales.

George D. Ogden, general freight agent, of the Pennsylvania Railroad, addressing the Reading (Pa.) Chamber of Commerce last Friday evening said, in part:

"In normal times carriers have been able to take traffic as offered without much concern as to prompt disposition at destination. A shipper could start upon an order involving ten or 100 cars and complete it by forwarding each day's output, thus saving second handling and valuable storage space at the factory. This practice can no longer continue if substantial co-operation is to be realized. The present condition of your own factory, working to its maximum capacity, affords a perspective, when multiplied a thousand times, of the unprecedented heavy movement of traffic. The railroads want to do better, just as much as you desire to attain greater efficiency. The unprecedented revival in business has caused a mountainous avalanche of traffic in almost every direction. Carriers refrained from placing restrictions until the last minute, indeed until a blockade was imminent; but, looking backward, it would have been more prudent if restrictions had been issued earlier against forwarding each day's output without first having knowledge of definite arrangement for prompt disposal. Until recently an embargo was the exception rather than the rule. It is quite as unpopular with railroad men as with the shipper. The serious problem for consideration is how to avoid embargoes during periods of business activity and the first potential move is absolutely to cease the general practice of making storage warehouses of freight cars. On export, the forwarding of each day's output without regard to ocean engagement may entail delay at the seaboard for weeks and in some cases months. Advancing prices invite speculation with its consequent abuse of railway equipment. A broker bought 100 carloads of gasoline on speculation, and it had to be held by the railroad for weeks while the price was advancing almost every day. This is a perfectly lawful practice, but it works havoc in the matter of service to the industry that has a large investment depending upon transportation service. To get out of the trouble we are in now we need each other's confidence and help. We must trust and believe in each other if we are to make progress. You may say the railroads have your confidence, but I cannot tell you too strongly that the only kind of confidence that counts for anything is the kind that is acted on. If the railroads are to be suspected of wrong or narrow motives in every proposal they make to help the situation, relief will be very slow. . . ."

That the congestion in the East has caused serious disturbances in freight movement as far west as the Missouri river and beyond, is already well known. Complaints are now heard as far away as Texas. Shippers have made formal complaint to the Texas Railroad Commission of their inability to obtain cars to move their freight and there seems to be little prospect of an early solution of the problem. The Texas commission is advised that upon the Panhandle lines of the Rock Island and the Santa Fe several millions bushels of wheat are awaiting cars to move it to market. Much of this grain is stored on the open ground and is subjected to damage by the elements. During the last few years all of the larger railroads of Texas have greatly increased their supply of cars, but the present unprecedented heavy movement of freight in the East has absorbed all surpluses.

THE STUDY OF TRANSPORTATION

[Santa Fe Magazine]

The *Railway Age Gazette* recently made an interesting comment about the lack of information imparted to students in the public schools regarding the railroads of the United States, and their importance to the people. "From the time of our earliest railroads they have been given little or no part in our scheme of education," the *Gazette* said. "In fact, there would almost seem to be a conspiracy of silence against them." Possibly the railroads themselves have not been awake to the value of this field of endeavor. For the purpose of ascertaining the views of educators on the subject, the Santa Fe's publicity department obtained interviews from one hundred teachers in twenty-four towns, in five states, and the opinion given by them was unanimous that more attention should be devoted to the study of the railroad question. The "conspiracy of silence" to which the *Gazette* referred, was not located, but the interviewers found several teachers who confessed that, owing to public prejudice against the railroads, they had not heretofore felt free to bring the subject before their classes. President Ripley, after learning the views of the teachers visited, sent copies of the Santa Fe's annual report to the high schools along the line for use in the libraries. A large number of superintendents, acknowledging receipt of the report, said it was the first volume of the kind ever submitted for their consideration, and expressed themselves as pleased to have such information for dissemination among students. Mr. Ripley directed that the heads of schools be advised that information about the Santa Fe would be furnished teachers and students upon request. Sixty applications for information were received within a week after the formal notices went to superintendents.

General News Department

At the request of the government the Canadian Railways have agreed to reduce fares for farm laborers coming into Canada from the United States to one cent a mile.

The lower house of the New York legislature, by an overwhelming vote—the Democrats in solid ranks and three-fourths of the Republicans—has rejected Assemblyman Nickerson's bill to repeal the full crew of the state.

Effective on March 18, the lines of the Chicago, Rock Island & Pacific from Iowa Junction, Iowa, to Iowa City; from Muscatine, Iowa, to Montezuma, and from Thornburg, Iowa, to What Cheer, were transferred to the Muscatine & Iowa City, as lessee of the Rock Island and receiver.

The shops of the Louisville, Henderson & St. Louis at Cloverport, Ky., together with several passenger cars, were destroyed by fire on the night of March 13. Included in the buildings destroyed was a roundhouse, and the loss, including damage to five locomotives is estimated at $150,000. The number of men employed in the shops was about 250.

The twelfth annual banquet of the Transportation Club of San Francisco was held at the Palace hotel, San Francisco, on March 4, with the largest attendance in the history of the organization. The speakers were Captain Robert Dollar, of the Dollar Steamship Company; M. H. De Young; C. M. Levey, general manager of the Western Pacific, and E. O. McCormick, vice-president of the Southern Pacific.

The Gulf & Ship Island resumed the running of trains under nearly normal conditions on March 16, following protracted disturbances by strikers. Trains were moved in many cases by new men brought from Chicago and other distant points. Following a number of instances of violence, the railroad company procured from the Federal Court at Mobile, Ala., an injunction against all persons, forbidding interference with the movement of trains.

The "Old Guard" of the auditing and treasury department of the Buffalo, Rochester & Pittsburgh, held its second annual banquet lately, and there were present 15 men who have served in that department an aggregate of 381 years, or an average of over 25 years each. Fourteen of the fifteen men have spent their entire service under the direction of the present head of the department, J. F. Dinkey, auditor and treasurer of the company. Mr. Dinkey began with 23 men, and now has nearly 100.

In addition to the increase in wages for shop employees on the Atchison, Topeka & Santa Fe, mentioned in last week's issue, the station forces and section foremen also had their pay advanced on March 1 by an average of about 10 per cent. The increase in the pay of the machinists will approximate $250,000 to $270,000 a year, and the total increase to unorganized employees on the road will amount to about $500,000 a year. The Chicago & Eastern Illinois has also recently made a general advance of about 10 per cent in the pay of a large number of its unorganized employees.

The United States Civil Service Commission announces examinations to be held April 19 for the following positions in the Interstate Commerce Commission, Division of Valuation: junior structural engineer, junior signal engineer, junior mechanical engineer, junior electrical engineer and junior telegraph and telephone engineer. In each of these offices there are two grades; Grade I, salary $1,200 to $1,680, and Grade II, salary $720 to $1,080. The commission also announces examinations, to be held May third and fourth, for the position of inspector of locomotives, under the Interstate Commerce Commission; salary $1,800. Applicants for this position must be between 25 and 50 years of age.

In the United States District Court at Trenton, N. J., March 16, the Lehigh Coal & Navigation Company was convicted of soliciting and receiving rebates from the Central Railroad of New Jersey. The indictment was in 27 counts. The prosecution of this case was begun more than a year ago. The railroad has already paid a heavy fine. The defense offered by the Lehigh Coal & Navigation Company was that it acted in entire good faith in accepting payments, since they were made as a part of the consideration under a contract by which in 1871 it leased the Lehigh & Susquehanna Railroad.

The Southern Pacific Company has recently made public the results of its annual inspection for 1915. This report is in the form of a booklet of 115 pages, giving in detail the rating of each division, district, station, shop building and pumping house. The Sacramento division, J. H. Dyer, superintendent, was given the best rating, with a score of 92.73. The Sacramento district of the Sacramento division, J. O'Donnell, roadmaster, was awarded the highest rating of 96.09, while the best section was No. 8, San Jose district, Coast division, L. B. Stacy, foreman, with a score of 98.6. A gold medal was awarded to the roadmaster, and another to the section foreman receiving the highest rating. A silver medal was awarded to the section foreman having the highest rating on each of 47 roadmasters' districts, to the agents of 45 stations receiving perfect markings, to the pumpers at 22 pumping stations and 5 fuel oil plants, and also to the engineers at 10 power plants having perfect stations. The average rating of all main line divisions was 92.70, and of branch lines 83.95. A total of 4,130 miles of main line, and 2,847 miles of branch lines were inspected.

A Correction

Through an oversight the statement was omitted in the publication of the paper by Pierce Butler, entitled, Important Principles Involved in Valuation, on page 477 of the issue of last week, that it was an abstract of an address presented before the annual dinner of the Traffic Club of Chicago on February 29.

Abuse of High-Speed Drills

[The Engineer]

Nothing will crack a high-speed drill more quickly than to turn a stream of cold lubricant on it after it has become heated by drilling. It is equally bad to plunge it into cold water after the point has been heated by grinding. Either of these practices is certain to impair the strength of the drill by starting a number of small cracks.

Disastrous Train Wreck in Mexico

A press despatch of March 21 reports the derailment of a train carrying troops on the Mexican Central's Pacific coast extension at Sayula, in which 50 or more soldiers were killed and more than 100 injured. The train was derailed by a loose or removed rail, and fell over a precipice.

Increase in Cost of Supplies

W. C. Nixon, receiver and chief operating officer of the St. Louis & San Francisco, has issued a circular to officers and employees urging economy in the use of supplies on account of the increase in prices. The circular says in part:

"The market prices of the principal materials and supplies used by this railroad are at the present time very largely in excess of those prevailing last year.

"The average increase in the current market price of all the articles mentioned (and you will note that the large items of rails, ties, ballast and fuel are not included) was 53.6 per cent. Our purchases last year of the articles listed amounted to $3,314,753. If the quantities purchased during the current year equal those of the previous year, the increase in price would cost us $1,776,707. In other words the quantity of material we purchased last year for $3,314,753 would cost this year, at current market prices, the sum of $5,091,460.

"This information is given to you coupled with the request that you make a special effort to defer, as much as you possibly

can, the purchase of these supplies, until prices again get back to normal.

"It is essential under these circumstances that our purchases should be restricted as far as possible and held to as low a minimum as is consistent with keeping the property in condition for safe operation. No material should be purchased which is not absolutely necessary to keep the property in that condition.

"The item of stationery alone cost us last year $262,917.42. The same amount of stationery purchased at current market prices this year would cost us $92,038.59 more, or a total of $355,006.01.

"In order that you may be fully informed as to the increases in the market prices of material prevailing today over those we paid last year, I have set forth herein a list of the principal items of material and supplies which we use and the percentage of increase in the price thereof.

"In considering this matter for the territory in your charge, you may find structures and facilities which it would ordinarily be better to fully renew than to repair in part, because the expenditure necessary to make sufficient repairs would go a long way towards covering the cost of complete renewal. A careful analysis may develop, however, that, considering the prevailing excessive prices of material, we would be better off if we made partial repairs at the present time instead of undertaking a complete renewal. This because we would make a saving in the long run by reason of having used less material at the prevailing excessive prices in making repairs than would be required to make a complete renewal.

"Other betterment work that is in contemplation, may perhaps, have to be deferred, even though such action, at this time, may increase our operating costs. An analysis of such situations may develop that we can better afford to incur increased operating costs rather than to furnish new or additional facilities at this time on account of the excessive cost of the necessary material.

"It is hoped that everyone will study this circular carefully, and it is requested that you aid the management by following the line of action suggested herein, and in addition thereto devising methods of your own to lessen the amount of new material used."

Appended to the circular is a list of articles, with the percentages of increase in price, ranging from 10 to 700 per cent.

The list of articles on which the increases range from 80 per cent to 700 per cent is as follows:

	Per Cent		Per Cent
Acids	168.5	Nuts, Square and Hexagon	122.5
Axles, Car and Engine	200.0	Pins, Locomotive Crank	146.1
Antimony and Babbitt Metal	193.6	Pipe, Galvanized	89.2
Bolts, Machine and Carriage	80.3	Rivets, all kinds	96.1
Bolts, Track	85.0	Rods, Piston	166.6
Brass, Bar, Sheet and Spring	122.0	Rope, Wire	95.0
Bridges, Steel	140.0	Spikes, Track	80.0
Castings, Malleable	80.0	Steel, Fire Box and Flange	137.0
Castings, Brass	85.0	Steel, Tank and Plate	150.0
Copper, Bar and Sheet	82.8	Steel, Tool, High Speed	700.0
Covering, Pipe, all kinds	100.0	Superheaters and Parts, Locomotive	100.0
Drills, all kinds	241.7	Tie Plates, Metal	140.8
Ferrules, Flue	140.1	Tubing, Brass, Copper and Steel	86.8
Flues, Boiler	100.0	Vitriol, Blue	373.7
Gasoline	181.5	Washers, Malleable	80.0
Iron, Galvanized	89.2	Wire, Copper and Brass	93.4
Iron, Black Sheet	100.0	Zincs, Battery	98.3
Lagging, Boiler	97.0		

The list of articles on which the increases range from 10 per cent to 80 per cent is as follows:

	Per Cent		Per Cent
Batteries and Renewals	22.1	Iron, Common Bar	75.0
Brake Beams, all kinds	32.0	Iron, Engine Bolts	36.0
Bolsters, Car and Engine	48.6	Iron, Stay Bolt	15.0
Boxes, Journal	14.0	Joints, Rail	29.3
Brushes, all kinds	10.0	Knuckles, Car and Engine	32.2
Burlap	56.1	Ladders, Freight Car	28.1
Burners, Lamp, all kinds	40.0	Lead, Pig and Sheet	55.0
Carlins, Car, all kinds	55.0	Leather, all kinds	29.9
Car Forgings	40.0	Lumber, Oak, Car and Engine	17.0
Castings, Steel	39.2	Lumber, Other	28.0
Cement, Portland	43.7	Nails, Wire, all sizes	54.5
Chains, all kinds	63.3	Netting, Engine Stack	33.3
Couplers, Car and Engine	25.0	Oils	30.9
Doors, Grain	33.3	Paints	18.8
Draft Gear, Miscellaneous	49.4	Paper, Roofing, all kinds	42.8
Draft Arms, Economy	22.0	Pipe, Cast Iron	33.0
Duck, Cotton	27.5	Pipe Lead	55.0
Dynamite, Powder and Caps	63.0	Pipe, Sewer	17.0
Enamels, all kinds	18.0	Plush	50.0
Fencing, Wire	58.0	Pumps, Water and Steam	25.0
Files	20.0	Reflectors, Headlight	76.7
Fusees	25.0	Rings, Packing and Piston	30.0
Frogs, Track	15.0	Roofs, Car, Metal	35.0
Glass, all kinds	22.3	Roofs, Plastic	26.0
Glasses, Gage and Lubricator	18.6	Rope, Manila	66.6
Hardware, Miscellaneous	28.0	Sand	40.0
Hose, Air Brake	25.0	Screws, all kinds	64.0
Hose, Other	20.0	Shovels and Scoops	35.0
Spikes, Boat	52.4	Waste, Cotton and Wool	58.2
Springs, Car and Engine	41.5	Wheels, Steel	16.0
Steel, Miscellaneous	65.0	Wire, Galvanized	58.0
Tires, Locomotive	38.5	Stationery	35.0
Valves	40.3	Miscellaneous Materials and Supplies not listed in detail above	42.3
Varnish	50.0		
Washers, Wrought	29.3		

Thorne's Expenses Paid by Government

Clifford Thorne, chairman of the Iowa Railroad Commission, has given out a statement saying that his expenses to attend the hearing at Washington, D. C., before the Senate committee, at which he opposed the appointment of L. D. Brandeis to the Supreme Court, were paid by the traffic representatives of eight of the largest cities in Iowa, together with the directors of the Corn Belt Meat Producers' Association and the Farmers' Co-operative Grain Dealers' Association. Since then, however, he said, he has received a draft from the treasurer of the United States, which was authorized by the Senate committee, paying his expenses in full, so that he has returned to the shippers' organizations the money which he had received from them.

Statement by President Sproule on Southern Pacific Land Grant Case

In view of the widespread interest taken in the Oregon and California land grant situation, President William Sproule of the Southern Pacific Company has issued the following explanation of the railroad company's position in the matter:

"The United States Supreme Court held that the company is the owner of the lands under the grant, with absolute title, subject only to the restriction that when it chooses to sell these lands it shall sell them only to actual settlers in parcels not exceeding 160 acres, and at a price not exceeding $2.50 an acre. It reversed Judge Wolverton, who had held that, because the company had sold these lands with the timber thereon in larger parcels than 160 acres, and to persons not actual settlers, and at prices exceeding $2.50 an acre, the company forfeited its title to all the land unsold.

"After receiving the grant the company offered the lands for sale in accordance with these restrictions, and in early times sold substantially all of the lands that were suitable for settlement, at prices not exceeding $2.50 an acre. But as the remaining lands were of a character not suitable for actual settlement, being timber lands in the mountains, it could not dispose of such lands by selling to actual settlers only, no such settlement being practicable.

"Thereafter the company did make sale of timber lands in larger tracts than 160 acres to persons other than actual settlers, and at prices exceeding $2.50 an acre. It was these sales that were made the foundation of a claim on the part of the government that the company had forfeited its title to all the lands unsold, which claim was rejected by the United States Supreme Court.

"In view of the decision of the Supreme Court, the company insists that, being the owner of these timber lands, and under no obligation to sell them, and in fact it being impossible to sell them under the restrictions of the grant, it has the right of any other owner to dispose of the timber on those lands, just as it would dispose of any other crop produced by the land at the same time admitting that when it comes to sell the land itself it must do so under the terms of the grant. The cutting of the timber from these lands is in fact a step toward making them fit for settlement, so that they may be disposed of under the terms of the grant.

"But the government contends that the company shall not be allowed to realize more than $2.50 an acre for any of these lands, even though they may be worth many times that amount because of the timber thereon, and that therefore the company has not the right to dispose of the timber growing upon these lands. It is strange, indeed, that the government should now maintain that the company has no right to the timber upon these lands, because for many years before coal was used as fuel it used this timber as fuel without question, and the right to do this is clear, because the act of Congress granted the lands 'to secure safe and speedy transportation of mails, troops, munitions of war, and public stores, over the line of said railroad.' Of course such object could not be accomplished without fuel to produce motive power.

"And, further, this provision of the law implies that the road shall be maintained, and certainly the use of this timber for

ties and lumber to be used in the construction and maintenance of the road would seem to be a matter beyond doubt.

"Further, the government, in the third section of the act, expressly granted the company the right to take timber from the government sections of land adjacent to the line of road, and under Section 10 it allowed the taking of timber from lands excepted from the grant by reason of being mineral. In view of this express grant, to take timber from lands owned by the government and not included in the grant, upon what pretext can the government deny the company the right to take timber from the lands granted to the company?

"The facts show that the position of the government, if carried out, would force upon the company a large financial loss; in other words, while this grant was one to aid the construction of the railroad, it would turn out to be, if the position of the government is correct, the means only of producing a deficit for the grantee, and this appears from the following facts, stating in round figures:

Expense to the company of administering this grant	$1,372,000.00
It has paid taxes on these lands aggregating	2,758,000.00
Making total expense and taxes	$4,130,000.00
The company's total cash receipts from all sources under this grant, including sales of lands, amount to	$5,345,000.00
This leaves the company a net revenue from past transactions of	1,215,000.00
The lands of this grant heretofore sold aggregate (acres)	804,637.75
Which have yielded the company therefor an average net revenue for the lands sold per acre of	1.51

"And, further, this grant required the company to carry free for the United States government its mails, troops, munitions of war and public stores over this railroad without limit as to time. The value of this free transportation at regular rates which has been furnished the government equals $2,084,467, which amount exceeds the receipts of the company under the grant by $868,641. It embraces the service between Portland and Roseville Junction, 664 miles.

"From the experience of the past we may be certain that the company will be called upon to furnish the government free transportation of the value of $75,000 per annum, and this is a perpetual obligation. Now, if we could sell every acre of the land at present unsold, viz., 2,400,000 acres, at the price of $2.50 per acre, this would yield $6,000,000, which would be used up in eighty years by the free transportation which we are bound to furnish the government, leaving the company thereafter—for all time—to furnish transportation to the government without compensation.

"But there is a considerable quantity of this land, at least 400,000 acres, which cannot be sold at any price, hence the amount that could be realized by sales would be something like $3,000,000 or $4,000,000 at the utmost, from which expenses of administration and taxes must be deducted.

"The company therefore insists upon its legal rights as the owner of these lands to dispose of the timber thereon, and any fair adjustment of this matter with the government, considering all the facts, would not deny to the company this right, a right which in a similar transaction between private individuals would not be questioned for a moment."

Fast Movement of Automobiles for United States Army

The Chicago, Rock Island & Pacific last week did some rapid work in handling on less than 24 hours' notice two trainloads of automobile trucks for the United States War Department for the use of the army on the Mexican border. The first information received by the road regarding the contemplated movement came from a passenger brakeman, who had learned of it in conversation with the representative of an automobile company on a Rock Island train on Monday, March 13. He immediately notified the vice-president's office, the railroad solicited the business, and on March 15 was advised that 14 carloads of automobile trucks, two trucks to a car, and one tourist car containing 33 men, who accompanied the trucks, would be delivered to the Rock Island early on the morning of March 16 by the Chicago & North Western, which handled the movement from the factory at Kenosha, Wis., to Chicago. The train was received by the Rock Island at its yard, Forty-fourth street, Chicago, at 7:37 a. m., March 16. The cars were inspected, and the train was put in condition for a fast run. It departed at 8:45 a. m., and arrived at Tucumcari, N. M., at 1 a. m. on March 18, and at El Paso, Tex., at 11:45 p. m. on the same day. The total time the train was in the possession of the Rock Island was 41 hr. 23 min. The distance from Chicago to Tucumcari is 1,134 miles, and an average speed of 27.4 miles an hour was made, including all terminal delays. The average speed, excluding the time at various intermediate terminals, was 30½ miles an hour. The El Paso & Southwestern, which moved the train from Tucumcari to El Paso, averaged 28.2 miles an hour.

On the strength of the good record made with the first shipment the Rock Island also received a second train of automobile trucks for shipment to Texas on Friday, March 17. The train, consisting of 14 automobile cars and one tourist car containing officers and men of the automobile company, came from Cleveland, and was delivered to the Rock Island by the Indiana Harbor Belt at Grand Trunk crossing, near Chicago, at 11:35 a. m. It was inspected and made ready for the fast run and departed over the Rock Island from Burr Oak yard at 12:05 p. m. the same day, and arrived at Tucumcari at 5 a. m. Sunday, March 19. The total time it was in the possession of the Rock Island was 40 hr. 45 min. The train was run at an average speed of 27.8 miles an hour from Chicago to Tucumcari, and the actual running time was 37 hr. 54 min., an average of 29.9 miles an hour. The train was run over the El Paso & Southwestern at an average speed of 28.1 miles an hour, and arrived at El Paso at 3:50 p. m., on Sunday the 19th.

A remarkable run by both trains was made over the Illinois division from Blue Island, Ill., to Silvis, a distance of 157 miles, the first train, that from Kenosha, making the run in 3 hr. 48 min., and the second train, that from Cleveland, making it in 3 hr. 45 min., or faster than 40 miles an hour for the entire distance. Both trains were run all the way on passenger train time, and while the War Department officers had been informed that the run from Chicago to El Paso would be made within 73 hours, it was actually made in about 52 hours. The movement of the two trains was without a mishap of any kind, not even a hot box or any delay. The only instructions the district and division operating officers received were that the government desired to get these trucks to the border as quickly as possible, and simply stated: "Operate this train special without additional tonnage, and run as fast as consistent with safety."

The division superintendents were not hampered with any special orders or suggestions while the trains were on the line.

New Wage Demands

The switchmen's union has filed demands on thirteen roads for an increase in wages to 50 cents per hour for foremen and 47 cents per hour for helpers, and time and one-half for overtime over eight hours. The roads are the New York Central, the Michigan Central, the Lehigh Valley, the Pere Marquette, the Rock Island, the Chicago & Eastern Illinois, the Chicago Great Western, the Elgin, Joliet & Eastern, the Cincinnati, New Orleans & Texas Pacific, the Baltimore & Ohio, the Chicago Terminal, the Delaware, Lackawanna & Western, the Minneapolis, St. Paul & Sault Ste. Marie, and the New York, Chicago & St. Louis.

Investigation of Freight Embargoes on Eastern Railways

The "executive committee" of the Eastern railways, sitting at New York City, empowered to deal with all freight embargoes, has sent 16 inspectors into New England. A sub-committee of which M. B. Casey (D. L. & W.) is chairman is to be in session continuously with Interstate Commerce Commissioner Clark at the Grand Central Terminal, studying the situation as it is disclosed by reports being sent in by all of the Eastern railways. The 16 inspectors, including two from the Interstate Commerce Commission, left New York March 22 to visit all points in Connecticut, Rhode Island and Massachusetts, for the purpose of ascertaining where freight can be accepted and cars promptly released, and where it cannot; also to ascertain whether the present congested condition has been caused by the railways or by the shippers, or by both. Eight additional inspectors are to be appointed to work in other territory.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AIR BRAKE ASSOCIATION.—E. M. Nellis, 53 State St., Boston, Mass. Next convention, May 2-5, 1916, Atlanta, Ga.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 21-23, 1916, Chicago.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—Willis H. Failing, Terminal Station, Central of New Jersey, Jersey City, N. J. Next meeting, May 17, 1916, Hotel Traymore, Atlantic City, N. J.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Traffic Manager, R. F. & P., Richmond, Va. Annual session, May 17, 1916, Washington, D. C.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month. Room 1856, Transportation Bldg., Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—J. G. Crawford, 547 W. Jackson Blvd., Chicago. Annual meeting, May 15-18, Hotel Sherman, Chicago.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Annual convention, May 23-26, 1916, Hollenden Hotel, Cleveland, Ohio.

NATIONAL RAILWAY APPLIANCES ASSOCIATION.—C. W. Kelly, 349 People's Gas Bldg., Chicago. Next convention, March 21-23, 1916, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Myers Bldg., Bethlehem, Pa. Midyear meeting, March 20, Chicago. Next annual convention, September, 1916, Grand Hotel, Mackinac Island, Mich.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, N. Y. C. R. R., Box C. Collingwood, Ohio. Annual meeting, May 15 to 17, 1916, Hotel Statler, Detroit, Mich.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. R. R., Atlanta, Ga. Next meeting, April, 1916.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEWARK.—Roy S. Bushy, Firemen's Bldg., Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen'l Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings, bi-monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings, October to May.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Grand Pacific Hotel, Chicago.

WOMEN'S SOCIETY OF ENGINEERS.—E. N. Layfield, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

Traffic News

At the War Department in Washington it is predicted that the Panama canal will be open for deep draft vessels by April 15.

The St. Louis, Iron Mountain & Southern has announced that on April 1 it will establish a new through freight service on fast schedules to and from New Orleans and other stations on the Trans-Mississippi Terminal Railroad.

On Sunday, March 12, the Nashville, Chattanooga & St. Louis put in service a through livestock train from East St. Louis to Atlanta, Ga., which makes the run in 30 hr. 45 min. While the train is intended primarily for livestock it also carries other carload freight destined to Atlanta and beyond.

It is announced in Philadelphia that the Pennsylvania Railroad will sell tickets to clergymen at half rates from points in Pennsylvania to any place outside that state. For intrastate journeys full fares are charged, the constitution of the State of Pennsylvania forbidding reductions. It appears that clergymen traveling to far western points have in some cases gone from Philadelphia to New York in order to get reduced rates over some other road.

The Pennsylvania Railroad has published freight tariffs naming rates to and from Curtis Bay, Md., Baltimore harbor. Curtis Bay is an important industrial section five miles south of the city, and has a railroad connection with the Baltimore & Ohio. The tariffs now announced are taken to indicate that the Pennsylvania has made an arrangement with the Chesapeake & Curtis Bay, the new railway company which has a franchise to operate industrial tracks in the Curtis Bay region, and with which the Pennsylvania can make connection by means of car floats.

The freight claim officers of various railroads entering St. Louis, at a meeting last week, effected a permanent organization, to be known as the Central Claim Conference, to include representatives of all roads and transportation companies entering the St. Louis district. The object of the organization is to facilitate the adjustment of claims. E. A. Jack, freight claim agent of the Terminal Railroad Association of St. Louis, was elected chairman, and L. Weiler, freight claim agent of the American Refrigerator Transit Company, was elected secretary. The meetings are to be held bi-monthly.

Reference has been made in previous issues to the arrangement made by the Atchison, Topeka & Santa Fe with the American-Hawaiian Steamship Company to transport from San Francisco to New York and Philadelphia, all rail, via Chicago, 250,000 tons of raw sugar in sacks, originating in the Hawaiian Islands, because the operation of the steamship company's line between Atlantic and Pacific ports has had to be suspended until the Panama canal is again opened. The steamship company has a fleet of 36 steamers, which were built to operate between the Atlantic and Pacific ports. Two of these steamers will continue on the Pacific, carrying sugar from the Hawaiian Islands to San Francisco, and the rest will be put in foreign service. The rail freight charges on the sugar shipments will be about $3,000,000. The rate established, effective on February 24, was 60 cents per 100 lb. from the Pacific coast to the refining points at Brooklyn, New York and Philadelphia. It will take about 7,000 cars to transport this total tonnage. The sugar is to arrive at California ports at the rate of 25,000 tons a month for 10 months. The first steamer, which arrived on February 17, brought 198 carloads, and the first train load arrived at Philadelphia on March 8. The steamer which docked at San Francisco on March 14 brought 325 carloads and two more steamers were expected during March. The business will be running heavily and regularly from April 1 on.

The Traffic Club of New York

At the regular monthly meeting of the Traffic Club of New York to be held at the Waldorf-Astoria 8 p. m, Tuesday, March 28, addresses will be delivered by W. C. Adamson, congressman from Georgia and the chairman of the committee on interstate and foreign commerce, and by F. C. Stevens, a former congressman from Minnesota, who will speak on "Railroads as Eleemosynaries."

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Fire Brick to Louisiana Points

Opinion by the commission:

Proposed increased rates on fire brick in carloads from Malvern and Perla, Ark., to Louisiana points are found not justified. (38 I. C. C., 249.)

Rate Reductions

E. Rickards v. Seaboard Air Line. Opinion by the commission:

Rates on mine-prop logs in carloads from Thelma and Vaughan, N. C., to Portsmouth, Va., are found unreasonable and discriminatory, and reasonable rates are prescribed for the future. (38 I. C. C., 218.)

Mutual Oil Company v. Chicago, Burlington & Quincy et al. Opinion by the commission:

Rates on petroleum and certain of its products in carloads from Cowley, Wyo., to Highwood and Coffee Creek, Mont., are found unreasonable. Reasonable rates are prescribed for the future and reparation awarded. (38 I. C. C., 221.)

Swift & Co. v. Morgan's Louisiana & Texas et al. Opinion by Commissioner Meyer:

Rates on rock salt in carloads from Louisiana points to Fort Worth and North Fort Worth, Tex., are found unreasonable. Reasonable maximum rates are prescribed for the future and reparation awarded. (38 I. C. C., 242.)

Rates on Packing-house Products from Mason City, Ia.

Jacob E. Decker & Sons v. Minneapolis & St. Louis et al. Opinion by the commission:

Rates on packing-house products and fresh meats in straight carloads from Mason City, Ia., to Arkansas and Texas points are not found unreasonable or discriminatory.

Rates to Louisiana points are found discriminatory to the extent that they exceed the rates from Chicago and grouped points by more than 2½ cents a 100 lb. on packing-house products, and 5 cents a 100 lb. on fresh meats. Reparation denied. (38 I. C. C., 228.)

Rates on Staves from Broken Bow, Okla.

Adams Stave Company v. Texas, Oklahoma & Eastern et al. Opinion by the commission:

The rates on gum and oak staves from Broken Bow, Okla., to Fresno and San Francisco, Cal., are found unreasonable to the extent that they exceeded the rates from Valliant, Okla. Rates from Broken Bow to various other points in the United States are found unreasonable to the extent that they exceed by more than 2 cents per 100 lb. the rates from Valliant to the same destinations. (38 I. C. C., 203.)

Lake and Rail Rate Cancellation

Opinion by Commissioner McChord:

The Grand Trunk and the Chicago, St. Paul, Minneapolis & Omaha are found not to have justified a proposed cancellation of joint rates in connection with the Port Huron & Duluth Steamship Company between points in trunk line territory and Duluth, Minn., and points south and west thereof. The steamship company is an independent line operating boats between Port Huron, Mich., and Duluth, Minn. The proposal to cancel the rates in issue resulted from a dispute as to divisions with the rail lines east of Buffalo. (38 I. C. C., 201.)

Central Freight Association Sand and Gravel Rates

Opinion by Commissioner McChord:

The commission finds that the New York Central has not justified proposed increased rates on sand and gravel in carloads from Erie, Pa., and Cleveland, Port Clinton, Sandusky and Toledo, Ohio, ports on Lake Erie, to various points in Central Freight Association territory. Proposed increased rates on the same commodities from Tecumseh, Mich., to certain points on the Detroit, Toledo & Ironton are found justified. (38 I. C. C., 196.)

STATE COMMISSIONS

The Railroad Commission of Louisiana, reporting on a complaint of unreasonable regulations in regard to cash fares on passenger trains, has reissued its order of two years ago, allowing the collection of one cent a mile additional, in cases where passengers, without good reason, board a train without a ticket, but with a maximum of ten cents. On a ride of, say, two miles, ticket fare ten cents, the cash-fare amounts to 12 cents. The present complaint appears to have been held to be unfounded; but the railroads are enjoined to have "a due regard for reasonableness."

COURT NEWS

Power to Lease Portions of Wharf

The Mississippi Supreme Court holds that a wharf, the terminus of a railroad, built under charter power at the foot of a public street, is private property, and it is not discrimination to lease a portion of it to one ship broker for storage of parcel freight and to decline to lease a portion to another ship broker, all the other portion of the wharf being used for general merchandise, all being given equal terms and rates; and adequate facilities for receiving freight being provided for in the city terminal.——Gulf & Ship Island (Miss.), 70 So. 704.

Railroad's Negligence Not Proved

In an action for wrongful death the plaintiff alleged that her husband was a passenger on one of the defendant's trains, and that upon arrival at his destination he undertook to walk alongside the train, and while walking past a water tank, he slipped on ice which had been negligently allowed to accumulate there, fell under the wheels of the train and was killed. He had expressed a purpose to come to the place where he was killed on one of the defendant's trains. No one saw him on the train, nor leaving it; nor was there any evidence that he had bought a ticket for passage on it. No proof was produced as to how he happened to be killed, outside of the circumstances of the location of the body and the conditions existing there. The Kansas Supreme Court holds that the evidence was not sufficient to show that the railroad failed to perform any duty it owed the deceased, or that his death was the proximate result of its negligence. Judgment for the railroad was affirmed.—Rodgers v. Rock Island (Kan.), 154 Pac. 1,027.

Railroads May Maintain Competing Restaurants

A restaurant keeper in Gillette, Wyo., brought an action against the C. B. & Q., alleging that the railroad had opened a restaurant in connection with its station at Gillette and operated it for the accommodation of passengers; that it also served the general public; that it shipped on its trains free of charge most of the commodities and supplies used in its business, while the plaintiff was required to pay the regular published rates; that it thus was able to sell at prices below those at which the plaintiff could make a profit; that, prior to the establishment of the defendant's restaurant, the plaintiff's receipts exceeded $100 a day, and his net profits $25 a day; that the defendant's competition had caused a decrease in the daily receipts to less than $50 and a decrease in the profits to practically nothing; that the plaintiff had been damaged by loss of profits in the sum of $2,900, and that there had been ample facility at the plaintiff's restaurant and other eating houses for the accommodation of the general public, including the defendant's employees. The Circuit Court of Appeals, Eighth Circuit, held that no cause of action was stated, and the case presented was one requiring determination by the Interstate Commerce Commission as to whether the establishment of an eating house at the point in question was proper. The petition did not show that all supplies were carried free of charge, nor that the general public was served with food prepared from commodities so carried, in

contravention of the Commission's rule, but did squarely challenge the railroad's right to establish an eating house at Gillette. Moreover, it did not appear that the plaintiff's loss of business was not due to general depression or some other cause not chargeable to the defendant. Railroad restaurants within the prescribed limits are desirable for the convenience of passengers and employees, and in this sense they are necessary, whether or not other and privately owned restaurants are available at the same point. The advantages of a common control of train schedules and eating facilities make this so.—Montgomery v. C. B. & Q., C. C. A., 228 Fed. 616.

Railroad's Right Under Federal Employers' Liability Act

The Supreme Court of the United States on March 13 reversed a decision of the Supreme Court of Texas, which affirmed an award of damages to the widow, children and parents of an employee, held to have been killed by negligence of the railroad, on the ground that, as the deceased was at the time engaged in interstate commerce, the right of recovery depended on the Federal employers' liability act, which only permits suit by a personal representative for the benefit of surviving widow or husband or children if there be such. The facts were as follows:

A ticket clerk who was required to be in a yard of the Pecos & Northern Texas at Amarillo to take a record of numbers on outgoing cars and to seal those that needed it was killed by a ballast car which was being pushed by an engine along track No. 5. Proceeding in behalf of herself, as next friend for her two minor children, and for the use and benefit of his parents, the clerk's widow instituted a suit for damages in the state district court. The jury returned a verdict for $7,000, and apportioned $2,000 respectively to the widow and each child, and $500 to each parent. The judgment thereon was sustained by the Texas Court of Civil Appeals and by the State Supreme Court. The railroad took the case to the United States Supreme Court.

When the deceased was killed he was walking between tracks 4 and 5 noting car numbers on a freight train of thirty odd cars on track No. 4. These cars, with one exception, were moving in interstate commerce, and there was enough evidence to support a finding that when killed the deceased was engaged in interstate commerce. The court held that, this being so, the right of recovery depended on the Federal employers' liability act, which only permits suit by a personal representative for the benefit of surviving widow or husband and children if there be such, and the jury should, as was requested by the railroad company, have been instructed to this effect. The judgment was therefore reversed and the cause remanded to the State Supreme Court for further proceedings. Pecos & Northern Texas v. Rosenbloom. Decided March 13, 1916.

Recent Cases Under Federal Employers' Liability Act

An engine engaged in interstate commerce was being taken out of the roundhouse by a hostler. The fireman followed it to the turntable, and when it had been placed thereon the hostler asked him to latch or lock the turntable. Being inexperienced he got his hand in such a position that when another employee, negligently and without warning, started the turntable, a finger was caught and injured. The Iowa Supreme Court held that, although his injury was caused by negligence of a fellow servant, he could sue under the federal employers' liability act. But an engine hostler has by virtue of his position no implied authority to call assistance in the absence of an emergency, so that the fireman, on responding to such a call, could not recover for injuries received while rendering the assistance asked. The federal employers' liability act does not permit recovery upon a mere showing that the employee was injured while engaged in interstate commerce, regardless of whether it was in the course of his employment or not, but the usual rules for such recovery apply.—Byram v. Illinois Central (Iowa), 154 N. W., 1,006.

The New Jersey Court of Errors and Appeals holds that where the death of an employee engaged in interstate commerce occurs under such circumstances that no remedy is given by the federal employers' liability act, as where there is no negligence as a producing cause, the federal act does not exclude the state workmen's compensation act, which applies to the case. The liability enforceable in a proceeding under the latter act is not a liability arising out of negligence, but a contractual obligation created by section 7 of the act with the consent of both the employer and the employee.—Winfield v. Erie (N. J.), 96 Atl., 394.

The assistant foreman of the gang on a work train was injured while the train was engaged in picking up old rails. The movement of the train on that day was wholly within one state, but the tracks extended into other states, and were constantly used in both interstate and intrastate commerce. It was held by the Circuit Court of Appeals that the work being done was necessary in keeping the tracks and roadbed in suitable condition for interstate commerce, and the man was at the time employed in interstate commerce.—P. B. & W. v. McConnell, 228 Fed., 263.

The Minnesota Supreme Court holds that the stations of a railway company engaged in interstate commerce constitute a part of the equipment of the company used in such commerce. An out-house at a station is a mere appendage thereto; and a crew engaged in transporting a new one to a station already in use for interstate traffic, for the purpose of installing it to take the place of an old one, is within the protection of the federal employers' liability act.—Nash v. Minneapolis & St. Louis (Minn.), 154 N. W., 957.

In an action for the death of an employee, brought under the employers' liability act, it appeared that the deceased was engaged in a night shift of employees in a sunken room where coal was moved from a dock to hoppers. Some of this coal was used to fill the tenders of locomotives drawing interstate trains. The deceased, part of the time, was required to clear the floor by shoveling coal which fell on it back into moving conveyors. The Wisconsin Supreme Court held that he was not engaged in interstate commerce so as to allow his representatives to bring an action for his death under the act.—Zavitowsky v. Chicago, M. & St. Paul (Wis.), 154 N. W., 974.

A brakeman was killed while engaged as a member of a switching crew in running cars of coal into bins for storage, part of which coal would ultimately be used in locomotives engaged in interstate commerce, and part in those engaged in intrastate commerce. The Kansas City Court of Appeals holds that he was not engaged in interstate commerce, since the coal had not been definitely and finally devoted to interstate commerce.—Harrington v. C. B. & Q. (Mo.), 180 S. W., 443.

A track repairer was injured while assisting in lifting a rail into the track of the defendant, whose principal roadbed ran through several states. The Kentucky Court of Appeals holds that the injury was in interstate commerce, so that the action therefor should have been brought under the federal act.— C. N. O. & T. P. (Ky.), 181 S. W., 940.

A passenger train moving between points within the same state, and not at the time carrying interstate passengers or baggage was held not to be engaged in interstate commerce, and an employee injured while inspecting the cars in the train was not within the act, although the train connected with interstate trains, advertised the fact, and frequently carried passengers destined for points in other states.—Boyle v. Pennsylvania, 228 Fed., 266.

Where a track repairer was injured while removing a wreck to repair the track of his employer engaged in interstate commerce, the Texas Court of Civil Appeals holds that the state fellow servant statute had no application; but the case was governed by the federal employers' liability act.—Missouri K. & T. v. Mooney (Tex.), 181 S. W., 543.

Hours of Service Act—"Continuously Operated Office"

On April 19, 1915, a railroad issued an order that, commencing with the 20th a telegraph office at Dayton, Idaho, at which one Vissing had been the sole operator, and which had been kept open only part of the day, should be continuously operated. An additional operator arranged for failed to appear, and the order was suspended until the evening of the 20th. Vissing, on the 20th, was on duty for the number of hours he had been accustomed to work; but, the services of an additional operator having been secured, the office was in fact kept open continuously on that day. In an action for penalties under the hours of service act, the Federal District Court, Idaho, E. D., held that the office was not, at the time of Vissing's service, a "continuously operated office" within the act, which limits the hours of service at such offices to 9, but permits 13 hours of service at offices not continuously operated; and the railroad was not liable.—United States v. O. S. L., 228 Fed. 561.

Railway Officers

Executive, Financial, Legal and Accounting

C. L. Wallace, recently appointed valuation engineer Texas & Pacific, and formerly valuation engineer Kansas City Southern, has been appointed assistant to the president of the Texas & Pacific, with headquarters at New Orleans, succeeding J. L. Lancaster, appointed vice-president. A biographical sketch of Mr. Wallace was published in the *Railway Age Gazette* of January 21, 1916.

In the reorganization of the New Orleans, Texas & Mexico, J. S. Pyeatt has been elected president, with office at Houston, Tex.; Y. Vandenberg was elected chairman of the board, with office at New York, and the following other officers have been appointed: G. H. Walker, vice-president, with office at St. Louis; J. H. Lauerdale, treasurer and assistant secretary, with office at New Orleans; Frank Andrews, general counsel, with office at Houston; Carl A. De Gersdorf, attorney, with office at New York; Generes Dusour, secretary, with office at New Orleans; J. W. McCullough, auditor, with office at Houston, Tex., and H. R. Josten, assistant secretary and assistant treasurer, with office at New York.

Alexis D. Parker, vice-president of the Colorado & Southern, retired from active service on March 1. Mr. Parker was born at Wilmington, Del., on July 26, 1859, and graduated from Racine college (Wisconsin) with the degree of A.B. in 1879, later receiving the degree of A.M. in 1882. He entered railway service in 1883 as a section laborer on the Denver & Rio Grande. From July 15 to Augsut 15, 1883, he was machinist's helper on the same railroad, and from the later date until February 4, 1884, was clerk in a storehouse. From February 4, 1884, to March 1, 1891, he held various clerical positions on the same railroad, and from March, 1891, to December 26, 1893, was chief clerk. He was appointed auditor for the receiver of the Union Pacific, Denver & Gulf in December, 1893, and retained that position until January 12, 1899. On August 8, 1894, he was also appointed auditor for the receiver of the Denver, Leadville & Gunnison. From January 12, 1899, to October 12, 1905, he was general auditor for the Colorado & Southern, and on October 12, 1905, was elected vice-president of the same railroad.

Operating

Clarence W. Bearden, assistant superintendent of the Chicago & Alton, has been appointed superintendent of transportation, with headquarters at Bloomington, Ill. Mr. Bearden served first as an operator, and later as a despatcher on the Southern Railway, at Charlotte, N. C., until January, 1903. He then entered the service of the Chicago & Alton as a despatcher at Bloomington, Ill. On November 1, 1909, he was promoted to chief despatcher, and in December of the following year he became assistant superintendent. He was appointed trainmaster of the Roodhouse division in June, 1912, but resumed his former duties as assistant superintendent on October 15, 1912, which position he held at the time of his recent appointment as superintendent of transportation at Bloomington, Ill., of the same road, as above noted.

C. W. Bearden

Samuel M. Rankin, whose appointment as superintendent of passenger transportation of the Pennsylvania Lines West of Pittsburgh has been announced, was born at Sewickley, Pa., on August 8, 1871. He received his education in the public schools of Sewickley, and entered the service of the Pennsylvania lines on June 18, 1887, as a telegraph operator on the eastern division. He has been continuously in the service of the same company ever since, occupying successively the positions of chief despatcher's assistant, chief passenger clerk in the office of the general superintendent of transportation, chief clerk to the assistant general superintendent of transportation, and chief clerk to the general superintendent of passenger transportation. On February 1, 1915, he was appointed assistant to the general superintendent of passenger transportation, and on March 1, 1916, was made superintendent of passenger transportation, with office at Pittsburgh, Pa.

S. M. Rankin

Xerxes H. Cornell, master of transportation of the Chicago & Alton, at Bloomington, Ill., has been promoted to general superintendent, with headquarters in the same city. In 1900 Mr. Cornell left the service of the Chicago, Indiana & Southern to go to the Grand Trunk as chief despatcher. Later, he was made trainmaster at Durand, Mich., and in 1904, was appointed master of transportation of the same road with office at Durand. In December, 1910, he went to the Chicago & Alton and the Toledo, St. Louis & Western as inspector of transportation, with office at Chicago, and in April, 1912, he was appointed superintendent of transportation at the same place. The following October he was appointed superintendent of transportation of the Pere Marquette with headquarters at Detroit, Mich., and in June, 1914, he returned to the service of the Chicago & Alton as master of transportation, which position he held at the time of his recent appointment as general superintendent of the same road, as above noted.

X. H. Cornell

R. E. Clarke, superintendent of transportation of the Gulf Coast Lines, at Houston, Tex., has resigned to become superintendent of car service of the Texas & Pacific.

E. G. Burdick has been appointed assistant general manager of the Inter-California Railway Company, with headquarters at Mexicali, L. C., Mexico, vice A. F. Andrade, resigned.

F. W. Parker, car accountant of the Gulf Coast Lines at Kingsville, Tex., has been appointed superintendent of transportation, with headquarters at Houston, Tex.; vice R. E. Clarke, resigned to accept service with another road.

J. L. Marquette, assistant superintendent of the Chicago & Alton, with office at Slater, Mo., has been promoted to super-

intendent of the western division, with headquarters at Kansas City, Mo., vice W. M. Corbett, resigned to become president of the Kansas City Terminal Railway.

Charles Henry Ewing, who has been appointed general manager of the Philadelphia & Reading, with headquarters at Philadelphia, Pa., was born on May 26, 1866, in Chester county, Pa. In August, 1883, he began railway work as a rodman with an engineering corps on the Philadelphia & Reading. From 1885 to 1886 he served as a transitman, and then, to 1889, as assistant engineer in charge of construction and maintenance. He was then appointed roadmaster, remaining in that position until 1892, when he became division engineer on the same road. From 1893 to July, 1902, he was chief engineer of the Central New England Railway, and then, to June, 1905, was division engineer of the Reading and Lebanon divisions of the Philadelphia & Reading. In June, 1905, he was appointed engineer maintenance of way of the same road, remaining in that position until 1910, when he became superintendent of the Atlantic City Railroad. On January 1, 1913, he was appointed general superintendent of the Philadelphia & Reading, which position he held at the time of his recent apppointment as general manager of the same road, as above noted.

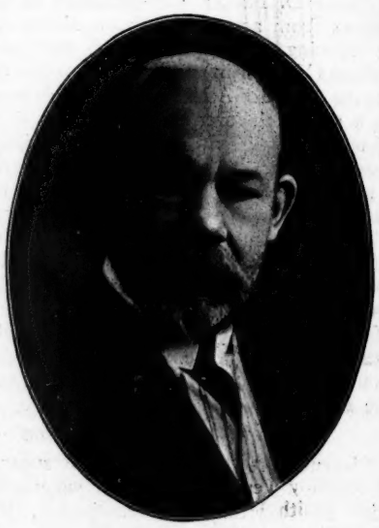
C. H. Ewing

James Warren Roberts, whose appointment as superintendent of freight transportation of the Pennsylvania Lines West of Pittsburgh has been announced, was born at Buckhannon, W. Va., on February 10, 1872. He attended the public and high schools in the State of Indiana, after which he took a business course in the Lafayette (Ind.) Business college, and later completed a scientific and law course at the old Indiana college at Covington, Ind. He first entered railway service with the Lake Erie & Western as a telegraph operator, and remained continuously with that road in various capacities from March 1, 1892, to February 28, 1900, inclusive. From March 1, 1900, to July 23, 1903, he was in the employ of the Cleveland, Cincinnati, Chicago & St. Louis, and from July 23, 1903, to January 4, 1904, in the employ of the Missouri, Kansas & Texas, leaving the latter road as chief clerk in the office of the general superintendent. He first entered the service of the Pennsylvania Lines on January 4, 1904, as a clerk in the transportation department of the Vandalia. He was promoted to assistant chief clerk in the office of the general manager on January 13, 1905, remaining in that position until January 16, 1910, when he was appointed assistant car accountant. He was promoted to car accountant on September 1, 1910, and was appointed superintendent of car service on October 1 of the following year. On February 1, 1915, he was made general superintendent of passenger transportation of the Pennsylvania Lines West of Pittsburgh. Under a change in organization which involved the abolishment of the positions of general superintendent of freight transportation and general superintendent of passenger transportation, Mr. Roberts was appointed superintendent of freight transportation of the Pennsylvania Lines West, effective March 1, 1916.

J. W. Roberts

Benjamin L. Bugg, whose appointment as general manager of the Atlanta, Birmingham & Atlantic, with headquarters at Atlanta, Ga., has been announced in these columns, was born on August 8, 1869, at Palo Alto, Miss. He received a high school education, and began railway work as a telegraph operator in 1887, on the Florida Railway & Navigation Company, now a part of the Seaboard Air Line. In 1891, he went to the Georgia Southern & Florida, and in 1895 left that company to go to the Central of Georgia. He was appointed general agent of the Old Dominion Steamship Company, at Norfolk, Va., in 1907; in August, 1910, he resigned to go to the Norfolk Southern as traffic manager, and in February, 1912, his authority was extended over the Raleigh, Charlotte & Southern. On September 1, 1912, he was appointed traffic manager of the Atlanta, Birmingham & Atlantic, and the following October was appointed assistant general manager, which position he held at the time of his recent appointment as general manager of the same road as above noted.

Arthur Hale has resigned as chairman of the committee on relations between railroads of the American Railway Association, effective on May 18. It is understood that he is to act in an advisory capacity to a number of coal companies, including the Consolidated Coal Company, with office in Baltimore, Md. Mr. Hale was born August 22, 1859, at Boston, Mass., the son of Rev. Dr. Edward Everett Hale. He was graduated from Harvard University in 1880, and entered railway service in 1882 as apprentice in the Altoona shops of the Pennsylvania railroad. He remained in the service of the Pennsylvania until June, 1901, consecutively as draftsman in the motive power department at Altoona, clerk in the transportation department at Philadelphia, chief clerk in the car record office and special agent of the transportation department until 1898, when he became superintendent of telegraph of that road. He became assistant general manager of the Baltimore & Ohio in June, 1901, and in December of the following year was made general superintendent of transportation of that road, resigning on January 1, 1909, to become general agent of the American Railway Association. While with the Baltimore & Ohio railroad Mr. Hale was in January, 1902, made chairman of the committee on car service of the American Railway Association, and in July of that year he became chairman of the per diem rules arbitration committee. In November, 1906, he was appointed chairman of the committee on car efficiency, which committee and the committee on car service were in June, 1909, merged into the committee on relations between railroads of the American Railway Association, of which latter committee he was chairman.



Arthur Hale

The jurisdiction of J. L. Brass, assistant to general manager of the Oregon-Washington Railroad & Navigation Company at Seattle, Wash., has been extended over Seattle and Argo freight house and yard terminals (except mechanical and store departments); also maintenance of way between Black River Junction and Seattle.

Charles H. Ewing, general superintendent of the Philadelphia & Reading, at Reading, Pa., has been appointed general manager, with headquarters at Philadelphia, Pa., that office having become

vacant by the promotion of A. T. Dice to the presidency; James E. Turk, superintendent of the Shamokin division, at Tamaqua, Pa., has been appointed general superintendent with office at Reading, succeeding Mr. Ewing. R. Boone Abbott, division engineer at Harrisburg, Pa., has been appointed superintendent of the Shamokin division, with headquarters at Tamaqua, succeeding Mr. Turk.

Francis G. Hoskins, whose appointment as superintendent of the Ohio River division of the Baltimore & Ohio, with headquarters at Parkesburg, Pa., has already been announced in these columns, was born in July, 1883, at Philadelphia, Pa., and was educated in the University of Pennsylvania. He began railway work in August, 1907, with the Baltimore & Ohio as a bridge draftsman, and in January of the following year was appointed an assistant engineer in the bridge department. In September, 1908, he was appointed general bridge inspector in the maintenance of way department, and in August, 1911, was appointed assistant division engineer at Pittsburgh, Pa., becoming assistant engineer in August, 1912, at Foxburg, Pa. He was appointed division engineer in April, 1914, at Connellsville, Pa.; in March of the following year he was transferred as division engineer to Philadelphia, and for the last month has served as special engineer on the staff of the general manager at Baltimore, Md.

Traffic

D. M. Hall has been appointed division freight agent of the Gulf Coast Lines, with office at Beaumont, Tex.

H. A. Jackson, assistant traffic manager of the Great Northern, has been appointed general traffic manager of the Great Northern Pacific Steamship Company, vice C. E. Stone, with office at San Francisco, Cal.

W. D. Sanderson has been appointed lake grain agent of the Lehigh Valley at Buffalo, N. Y., a new position. He will have charge of the solicitation of all grain arriving in Buffalo by the boats from the west.

H. L. Hudson, district freight and passenger agent of the Oregon-Washington Railroad & Navigation Company, at Seattle, Wash., has been appointed assistant general freight and passenger agent, with headquarters at Seattle.

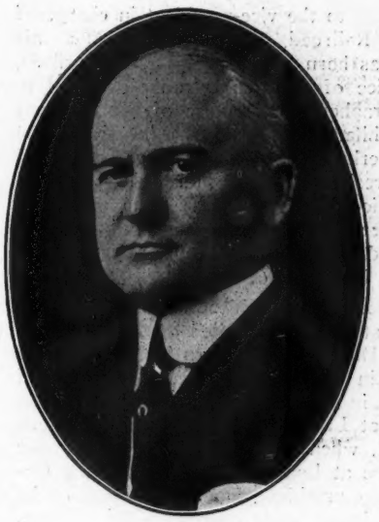
J. J. Fahey, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Memphis, Tenn., has been transferred to St. Louis, Mo. F. E. Pruett has been appointed commercial agent at Memphis, to succeed Mr. Fahey.

P. C. Benedict, district passenger agent of the Cincinnati, Hamilton & Dayton, at Cincinnati, Ohio, has been transferred in the same capacity to the Baltimore & Ohio at Chicago; vice W. W. Pickering, who has been appointed traveling passenger agent of the Baltimore & Ohio, at Cumberland, Pa.

C. H. Webb, assistant general freight agent of the Gulf Coast Lines, has temporarily retired from service owing to ill health, effective April 1. Roy Terrell has been appointed assistant general freight agent, with headquarters at New Orleans, effective March 1. H. W. Pinnick has been appointed general agent, passenger department, with office at Houston, Tex. Mark Anthony has been appointed general agent, passenger department, with office at New Orleans, La. C. C. Lewis has been made general agent, with headquarters at Houston, Tex. E. E. Peacock has been appointed general agent, with headquarters at Dallas, Tex. Charles N. Gray has been appointed commercial agent, with offices at Shreveport, La. J. R. MacLeod has been appointed commercial agent, with office at Baton Rouge, La.

George Stephen, who has been appointed assistant freight traffic manager of the Canadian Northern west of, and including Port Arthur, Ont., and Duluth, Minn., was born on July 5, 1876, at Montreal, Que. He was educated in the public and high schools of his native city, and on June 22, 1889, entered railway service as an employee of the Canadian Pacific. Until August, 1899, he was employed in the foreign freight department of the Canadian Pacific at Montreal and St. John, N. B. From September 1, 1899, to July, 1900, he was chief clerk in the general freight office of the same railway at Winnipeg, Man. From July to December, 1900, he was traveling freight agent for the same railway in Manitoba and Saskatchewan. From January to June, 1901, he was contracting agent in the Kootenay territory. In June, 1901, he returned to Winnipeg, as chief clerk in the general freight office of the Canadian Northern, remaining there until December 1, 1906, when he was appointed assistant general freight agent of the same railroad. On May 1, 1909, he was promoted to general freight agent, a position he continued to hold until March 1, 1916, when he was appointed assistant freight traffic manager, with office at Winnipeg.

C. W. Pitts, who has been appointed assistant general passenger agent of the Great Northern and the Northern Steamship Company, with office at Chicago, Ill., was born at Brandon, Vt., on August 1, 1867. He was educated in the common and high schools of Brandon. He entered railway service in 1885 as a station agent for the Union Pacific at Lexington, Neb. From 1886 to 1889 he was city ticket agent of the Northern Pacific at Helena, Mont. He held the same position for the Great Northern at Helena, from 1889 to 1896. In 1896 he was transferred to Chicago as traveling passenger agent, a position he held until 1906, when he was promoted to general agent of the passenger department. His recent promotion to assistant general passenger agent of the Great Northern and the Northern Steamship Company was effective on March 1.



C. W. Pitts

Engineering and Rolling Stock

B. M. Cheney has been appointed general inspector permanent way and structures of the Chicago, Burlington & Quincy, with headquarters at Chicago, Ill.

P. C. Moshisky, joint foreman of the Denver & Rio Grande at Durango, Col., has been appointed master mechanic, with headquarters at Ridgway, Col., vice J. A. Edwards, resigned.

A. Brown, locomotive foreman of the Canadian Pacific at Ft. William, Ont., has been promoted to district master mechanic at Winnipeg, Man., vice A. Peers, transferred to Moose Jaw, Sask.

R. N. Millice has been appointed assistant locomotive superintendent of the United Railways of Havana, at Cienaga, Cuba, succeeding C. F. Roberts, deceased, and John P. Risque has been appointed mechanical engineer, with headquarters at Havana, Cuba.

W. B. Embury, master mechanic of the Chicago, Rock Island & Pacific at Valley Junction, Iowa, has been transferred to Estherville, Iowa, vice W. T. Fitzgerald, transferred to Manly, Iowa, replacing R. C. Hyde, who has been transferred to Valley Junction.

William Gemlo, who resigned recently as master mechanic of the Minneapolis & St. Louis, has been appointed road foreman of engines, at Watertown, S. D. R. Haylor has been appointed road foreman of engines at Fort Dodge, Iowa, and J. L. Brummel has been appointed road foreman of engines at Monmouth, Ill.

B. B. Eidson, road foreman of locomotives of the Grand Trunk Pacific at Smithers, B. C., has been appointed road foreman of locomotives with office at Regina, Sask. J. Moriarty, roadmaster at Edson, Alta., has been appointed roadmaster, subdivisions 11 and 12, with headquarters at Endako, B. C., vice J. A. McM. Brown, resigned.

OBITUARY

George W. Roberts, roadmaster of the Central of Georgia at Columbus, Ga., died on March 14, at his home in Columbus at the age of 59.

Lewis Peck Morehouse, formerly custodian of deeds of the Illinois Central, died at Los Angeles, Cal., on March 18, at the age of 80. He was born at New Haven, Conn., on March 30, 1835, and entered the service of the Illinois Central on May 1,

1857, serving as assistant engineer and assistant chief engineer until June, 1877, when he became chief clerk, road department in Chicago. From June, 1878, to 1882, he was stationer, and from 1882 to May, 1887, was tax agent. From 1887 to January, 1891, he was land commissioner and tax agent. He was then to August, 1898, tax commissioner and custodian of deeds, and from 1898, to March 31, 1905, was custodian of deeds. He retired on pension on April 1, 1905.

Joseph Richardson, assistant to the vice-president in charge of traffic of the Pennsylvania Railroad, died on March 20 at his home in Media, Pa. He was born in Philadelphia on April 30, 1867, and entered the service of the Pennsylvania Railroad in October, 1889, as a stenographer in the office of the assistant general freight agent at Philadelphia, and subsequently served as special agent and chief clerk. In June, 1910, he was promoted to assistant to third vice-president, and in March, 1911, he became assistant to second vice-president of the same road. In May, 1912, when the practice of designating the vice-presidents numerically was discontinued, Mr. Richardson was appointed assistant to the vice-president in charge of traffic.

William J. Dickinson, second vice-president and a director of the Louisville & Nashville at New York, died on March 20, at his home in Yonkers. Mr. Dickinson was born in England, and came to the United States in 1879. He entered the service of the Louisville & Nashville in September, 1882, as a clerk in the accounting department at Louisville, Ky., and held various positions until June 1, 1901, when he was appointed controller of the same road, with office at Louisville. The following October he was elected third vice-president, from which position he resigned for the purpose of laying aside railroad work in June, 1905. Mr. Dickinson was elected second vice-president of the Louisville & Nashville on December 15, 1910, and since January, 1911, was also a director.

Frederick N. Finney, who was president of the Missouri, Kansas & Texas from October, 1904, to December, 1906, died on March 19 at San Francisco, Cal., at the age of 85. He was born in Boston, Mass., and began railway work in 1854 as a rodman on the Cincinnati, Harrison & Indianapolis Short Line. He subsequently served in the engineering and operating departments of different roads, and from June, 1870, to October, 1873, was chief engineer and general superintendent of the Canada Southern. From April, 1875, to July, 1878, he was chief engineer and superintendent of the Toledo, Peoria & Warsaw, and then became general manager of the Wisconsin Central associated lines, becoming managing director of the same company in October, 1886. From June, 1890, to July of the following year he was president of the Minneapolis, St. Paul & Sault Ste. Marie, and second vice-president of the Duluth, South Shore & Atlantic. He was then from December, 1894, to October, 1904, superintendent of construction and director and member of the executive committee of the Missouri, Kansas & Texas, serving from October, 1904, to December, 1906, as president of the same road.

John F. Miller, who was vice-president of the Cleveland, Akron & Columbus from 1901 to 1905, died on March 19 at his home in Richmond, Ind. He was born on July 16, 1830, at Ithaca, N. Y., and began railway work in 1850 as a carpenter on the Cleveland, Columbus, Cincinnati & Indianapolis. He subsequently served as brakeman and conductor on the same road; as conductor on the Central Ohio, now a part of the Baltimore & Ohio, and then as conductor on the Columbus & Steubenville, now a part of the Pittsburgh, Cincinnati, Chicago & St. Louis. From 1859 to 1862 he was in charge of terminals at Cleveland, Ohio, for all yards except the Cleveland & Pittsburgh, including the Lake Shore & Michigan Southern; Cleveland, Columbus, Cincinnati & Indianapolis and Cleveland & Toledo. He then served first as passenger conductor, and later as assistant trainmaster on the Little Miami Railroad, and from 1864 to 1885 as superintendent of the Chicago, St. Louis & Pittsburgh, now a part of the Pennsylvania Lines. He was then, to January, 1901, general superintendent of the Pennsylvania Lines West of Pittsburgh (Southwest system) at Columbus, Ohio, retiring from that position under the pension plan of the Pennsylvania Lines. From January, 1901, to September, 1906, he was vice-president of the Cleveland, Akron & Columbus, and from April, 1901, to July, 1905, was also national commissioner of the Louisiana Purchase Exposition Commission.

Equipment and Supplies

LOCOMOTIVES

THE PHILADELPHIA & READING is in the market for 25 locomotives.

THE CHICAGO, MILWAUKEE & GARY is in the market for one locomotive.

THE COAL & COKE has issued inquiries for 2 Consolidation locomotives.

THE ANN ARBOR is in the market for 3 or 4 Mikado type locomotives.

THE LEHIGH VALLEY is understood to be about to purchase 25 additional locomotives.

THE CENTRAL OF NEW JERSEY is in the market for 5 eight-wheel switching locomotives.

THE GREAT NORTHERN has ordered 25 Mikado locomotives from the Baldwin Locomotive Works.

THE SOUTHERN RAILWAY has issued inquiries for 5 Mountain and 20 Santa Fe type locomotives.

THE NORFOLK & WESTERN has ordered 6 Consolidation locomotives from the Baldwin Locomotive Works.

THE ARICA-LA PAZ RAILWAY, Arica, Chile, has ordered one locomotive from the Baldwin Locomotive Works.

THE ASHLAND COAL & IRON COMPANY, Ashland, Ky., has ordered one Consolidation locomotive from the Baldwin Locomotive Works.

THE INGERSOLL-RAND COMPANY, Phillipsburg, N. J., has ordered one six-wheel switching locomotive from the Baldwin Locomotive Works.

THE CHICAGO, BURLINGTON & QUINCY has withdrawn its inquiry for 15 Mikado and 15 Santa Fe type locomotives, mentioned in the *Railway Age Gazette* of March 10.

THE CHICAGO GREAT WESTERN, reported in last week's issue as inquiring for 10 switching locomotives, has ordered 10 six-wheel switching locomotives from the Baldwin Locomotive Works.

THE ST. LOUIS & SAN FRANCISCO, reported in the *Railway Age Gazette* of February 25 as having issued inquiries for 30 Santa Fe type locomotives, has ordered these locomotives from the Baldwin Locomotive Works.

THE MONTOUR RAILROAD has ordered 4 superheater Mikado locomotives from the American Locomotive Company. These locomotives will have 27 by 32-in. cylinders, 57-in. driving wheels, and a total weight in working order of 297,000 lb.

THE GREEN BAY & WESTERN has ordered one superheater Mogul type locomotive from the American Locomotive Company. This locomotive will have 19 by 26-in. cylinders, 56-in. driving wheels. and a total weight in working order of 139,000 lb.

THE CHICAGO RIVER & INDIANA has ordered one superheater six-wheel switching locomotive from the American Locomotive Company. This locomotive will have 20 by 26-in. cylinders, 51-in. driving wheels, and a total weight in working order of 150,000 lb.

THE PEKIN-KALGAN RAILWAY has ordered 4 Mikado locomotives from the American Locomotive Company. These locomotives will have 20 by 28-in. cylinders, 50-in. driving wheels, a total weight in working order of 186,000 lb., and will be equipped with superheaters.

THE NEVADA NORTHERN was reported in last week's issue as having ordered one Consolidation locomotive from the American Locomotive Company. This locomotive will have 21 by 30-in. cylinders, 51-in. driving wheels, a total weight in working order of 200,000 lb., and will be equipped with a superheater.

THE CHICAGO JUNCTION, reported in last week's issue as in-

quiring for a number of locomotives, has ordered 5 superheater six-wheel switching locomotives from the American Locomotive Company. These locomotives will have 20 by 26-in. cylinders, 51-in. driving wheels, and a total weight in working order of 150,000 lb.

FREIGHT CARS

THE CUDAHY PACKING COMPANY has issued inquiries for 100 center sills.

THE LONG ISLAND is reported to be in the market for 15 refrigerator cars.

THE UNITED VERDE COPPER COMPANY, New York, is reported in the market for 30 ore cars.

THE CARNEGIE STEEL COMPANY is in the market for 60 gondola, 10 hopper and 10 flat cars.

THE CALUMET & ARIZONA MINING COMPANY, Calumet, Mich., is in the market for 30 tank cars.

MORRIS & CO. have withdrawn the inquiry for 150 stock cars mentioned in the *Railway Age Gazette* of February 25.

THE KANAWHA & WEST VIRGINIA is said to be in the market for 50 underframes. This item has not been confirmed.

THE CINCINNATI, NEW ORLEANS & TEXAS PACIFIC is contemplating the purchase of 300 to 500 center constructions.

THE ALLIS-CHALMERS MANUFACTURING COMPANY, Milwaukee, Wis., is said to have issued an inquiry for 20 flat and 2 gondola cars.

THE CHICAGO, BURLINGTON & QUINCY has withdrawn its inquiry for 1,000 box and 500 automobile cars, mentioned in the *Railway Age Gazette* of March 3.

PASSENGER CARS

THE BAY STATE STREET RAILWAY COMPANY, Boston, Mass., has ordered 200 semi-convertible inter-urban cars from the Laconia Car Company.

THE ARMS PALACE HORSE CAR COMPANY, reported in the *Railway Age Gazette* of March 3 as contemplating the purchase of horse express cars, has ordered 10 cars of that type from the Barney & Smith Car Company.

THE ATLANTIC COAST LINE, reported in the *Railway Age Gazette* of February 25 as having issued inquiries for passenger cars, has ordered 6 baggage, 4 baggage and mail, and 2 passenger and baggage cars, and 10 coaches from the Pullman Company.

THE SOUTHERN RAILWAY, reported in last week's issue as inquiring for prices on passenger train cars, has issued inquiries for 25 coaches, 10 baggage and express cars, 5 club cars, 10 passenger and baggage cars, and 10 baggage and mail cars, a total of 60.

THE PENNSYLVANIA EQUIPMENT COMPANY, Philadelphia, Pa., is in the market for 3 second-hand 60-ft. passenger coaches, and also for 2 or 3 second-hand passenger coaches having an approximate length over-all of 40 ft., with 30-ft. truck centers and 5½-ft. wheel base.

THE AUSTRALIAN COMMONWEALTH has withdrawn its inquiries for prices on 5 first-class sleeping, 5 second-class sleeping, 3 dining and 3 club cars, mentioned in the *Railway Age Gazette* of February 18. It is understood that a surplus of labor in the Commonwealth has made it advisable for the cars to be constructed there. The material will be purchased in this country.

IRON AND STEEL

THE ILLINOIS CENTRAL has ordered 35,000 tons of rails.

THE ERIE is about to place orders for 40,000 tons of rails.

THE BOSTON & MAINE is in the market for 15,000 tons of rails.

THE ATLANTIC COAST LINE is in the market for 15,000 tons of rails.

THE CHICAGO, BURLINGTON & QUINCY has ordered 20,000 tons of rails.

THE NEW YORK CENTRAL has ordered 72,000 tons of rails from the Lackawanna Steel Company, the Pennsylvania Steel Company and the United States Steel Corporation.

THE MISSOURI, KANSAS & TEXAS will place orders soon for about 15,000 tons of rails.

THE CHICAGO & NORTH WESTERN has ordered 40,000 tons of rails from the Illinois Steel Company for 1917 delivery.

THE CHICAGO, MILWAUKEE & ST. PAUL has ordered 40,000 tons of rails from the Illinois Steel Company, 5,000 tons from the Lackawanna Steel Company, 2,500 tons from the Pennsylvania Steel Company, and 2,500 tons from the Bethlehem Steel Company.

MISCELLANEOUS

THE PENNSYLVANIA EQUIPMENT COMPANY, Philadelphia, Pa., is in the market for a second-hand 10 to 15-ton locomotive crane. A boiler conforming to Massachusetts standard is required.

SIGNALING

THE CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA is to instal automatic block signals on its line from St. Paul, Minn., to Mankato, 84 miles, single track.

THE DENVER UNION TERMINAL COMPANY has awarded a contract to the General Railway Signal Company for the construction of two interlocking plants, controlling movements of trains into the new Union Passenger Station at Denver, Colo. The two plants will have 120 and 128 levers respectively. The field work will probably begin on April 1.

THE ILLINOIS CENTRAL plans to install automatic block signals on the following lines: Mississippi division, East Junction (Memphis, Tenn.) to Canton, Miss., single-track; Lousiana division, Canton, Miss., to Asylum (Jackson, Miss.), single-track, and Nogan, Miss., to Kenner Junction, La., double-track. The total single-track mileage is about 204, and the double-track mileage 167, a total of 371.

THE CHICAGO & ALTON has requested bids on an all-electric or electro-pneumatic interlocking plant to be installed at Corwith, Ill., jointly with the Atchison, Topeka & Santa Fe. The plant will require a 104-lever machine and will include 22 derails, 21 switches, 32 signals, 2 outlying switch locks, and route, detector, and sectional route locking. A brick tower with electric lighting will be installed.

THE MISSOURI PACIFIC-IRON MOUNTAIN SYSTEM, which was reported in the issue of February 4 as having ordered material for an installation of automatic block signals, will install such protection on 39 miles of line on the St. Louis, Iron Mountain & Southern between Piedmont, Mo., and Poplar Bluff. The Federal Signal Company's signals will be used. In addition to this, authority has been granted for a 24-lever mechanical interlocking plant at the crossing of the Atchison, Topeka & Santa Fe at Nepesta, Colo.

THE NASHVILLE, CHATTANOOGA & ST. LOUIS has installed electric interlocking towers at Sherwood, Tenn., and Rockledge to be operated in connection with the automatic block system which has been in operation at these points. The company is also preparing to extend its telephone service, and expects by July to have in operation a double copper wire circuit between Nashville, Tenn., and Hollow Rock Junction, 95 miles. Contracts for the poles and wire have been placed. With the completion of this line, the company will have telephone control of trains over 271 miles of line, as the line to Chattanooga, Tenn., is 151 miles long, and there are 20 miles additional on the Tracy City (Tenn.) branch, and 5 miles on the Jasper (Tenn.) branch. There will be two circuits of two wires each on the Nashville-Hollow Rock Junction line, one for despatching and one for messages. The distribution of poles for the new system will begin within the next ten days, as the survey has just been completed.

CAR FERRY SERVICE FROM SWEDEN.—Having practically completed plans for a railroad car ferry service between Gothenburg, Sweden, and an English North Sea port, presumably Immingham, the Swedish Board of Trade is considering establishing a similar line from Stockholm and Abo, Finland.

Supply Trade News

The McClellan Refrigerating Machine Company has removed its general offices and works to 564-570 West Adams street, Chicago.

Patrick T. Walsh, a well known railroad contractor and president of the Walsh-Kahl Construction Company, died at his home at Davenport, Ia., on March 16, following a stroke of apoplexy.

The United States Cast Iron Pipe & Foundry Company, Burlington, N. J., will move its southern sales and traffic offices from Chattanooga, Tenn., to 1002 American Trust & Savings Bank building, Birmingham, Ala. This change becomes effective April 1.

Charles Morgan Hewitt, chairman of the board of directors of the Magnus Company, Inc., and president of the Hewitt Company, both of Chicago, died at Palm Beach, Fla., on March 16, after a prolonged illness.

C. M. Hewitt

Mr. Hewitt was born at Detroit, Mich., on August 7, 1857. He entered the service of the Michigan Central at Detroit upon leaving school. Beginning with 1883 he was superintendent for the Pullman Company at Chicago. Later he was placed in charge of the St. Charles Car Company at St. Charles, Mo., subsequently leaving this company to join his brother, Herbert H. Hewitt, in the organization of the Hewitt Manufacturing Company at Chicago. This company was absorbed by the Magnus Company, Incorporated, of which Mr. Hewitt became chairman of the board. In 1902, Mr. Hewitt organized and became president of the Hewitt Company of Chicago.

Geo. E. Fox, formerly southeastern representative of the Curtain Supply Company, has been appointed western sales agent of the same company, with headquarters in Chicago. T. P. O'Brian has been appointed southeastern sales agent, with headquarters at New York City, effective April 1. Mr. O'Brian has been with the O M. Edwards Company of Syracuse, N. Y., for a number of years.

The statement in last week's issue to the effect that H. A. Gray has been appointed manager of the railroad department of Joseph T. Ryerson & Son was incorrect. Mr. Gray has been appointed assistant manager railroad sales, with jurisdiction over Eastern railroad and machinery sales, with headquarters at New York. All branches of the sales and operating departments will be directed as heretofore, from Chicago.

Ralph G. Coburn, for the last few years eastern sales manager of the Franklin Railway Supply Company, has been appointed sales manager of the electrical department of that company, now handling the Stone-Franklin lighting equipment. Mr. Coburn has been with the Franklin Railway Supply Company for the past seven years, and was at one time in charge of its Chicago office. His headquarters will be in New York.

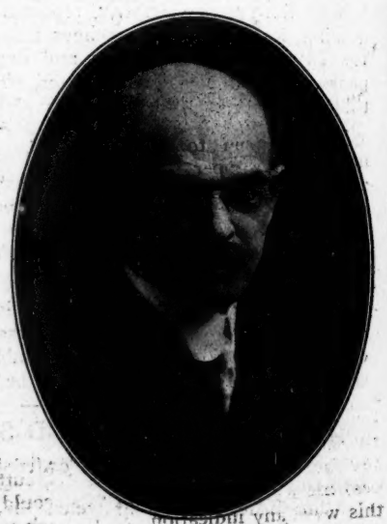
Fairbanks, Morse & Co., Chicago, Ill., have filed at the State capitol at Springfield, Ill., a certificate of increase of capital stock from $1,900,000 to $4,000,000, of which $2,000,000 will be six per cent preferred stock and $2,000,000 common stock. The increase in capital is incidental to the proposed purchase of the scale factory of E. & T. Fairbanks & Co., of St. Johnsbury, Vt., for the output of which Fairbanks, Morse & Co. have been Western agents for upwards of 50 years.

G. H. Groce on January 1, 1916, entered upon his new duties as head of the railway department of the Electric Storage Battery Company of Philadelphia, with headquarters at Chicago. Mr. Groce was born at Tarentum, Pa., February 19, 1864. He was educated in the public schools, and in 1880 became a telegraph operator on the Pittsburgh & Lake Erie. After two years' service on that road, he was for one year an operator on the Baltimore & Ohio, and then returned to the Pittsburgh & Lake Erie as freight and ticket agent and train despatcher. From 1885 to 1897 he held positions with various roads as train despatcher, chief train despatcher and chief clerk in the general superintendent's office. In 1897 he became superintendent of telegraph of the Baltimore & Ohio Southwestern, and from 1899 to 1901 was superintendent of the Springfield division of that road. In 1902 he became southwestern agent of the Taylor Signal Company at St. Louis. He returned to railway work the following year, serving from 1903 to 1910 as superintendent of telegraph and assistant to the general manager of the Illinois Central. From 1910 to 1912 he was assistant to the president of the General Railway Signal Company, and for the following two years was vice-president of the Wright Telegraphic Typewriter Company. For the past year he has been engaged in special work for the General Railway Signal Company.

G. H. Groce

John Scott Legacy Medal Awarded to Clement F. Street

The city of Philadelphia, acting on the recommendation of the Franklin Institute, has awarded the John Scott Legacy Medal and Premium to Clement F. Street, vice-president of the Locomotive Stoker Company, for the Street locomotive stoker. About 100 years ago John Scott, a chemist and metallurgist of Edinburgh, left to Philadelphia a large sum of money, the interest on which is used for the encouragement of "ingenious men and women who make useful inventions." The legacy also provides for the distribution of a medal inscribed "To the Most Deserving," and a money premium to such persons whose inventions shall merit it.



C. F. Street

Mr. Street was at one time mechanical editor and manager of the Railway and Engineering Review, now the Railway Review. He was later associated with the Dayton Malleable Iron Company for nine years, engaging in the designing and selling of railway supplies; with the Wellman, Seaver, Morgan Company, and the Westinghouse Electric & Manufacturing Company. He began development work on the stoker that bears his name in November, 1907, the first

machine being put in service on a Lake Shore & Michigan Southern locomotive in May, 1909. There are now 1,000 Street stokers in service and on order.

In accepting the award of the Medal and Premium, Mr. Street expressed his high appreciation of the honor which had been conferred upon him by the Franklin Institute. He took occasion to give full credit to his assistants who had helped him perfect the stoker. He also made the statement that Herman H. Westinghouse, president of the Westinghouse Air Brake Company, was the man who really made the Street stoker a success, and added that had it not been for the financial backing which he secured and, equally important, the moral support he gave it and the men who were developing it, the machine would not be where it is today.

Sydney O. Swenson, for the past four years electrical engineer of the Kansas City Terminal Railway, has become a member of the engineering office of Putnam A. Bates, 2 Rector street, New York. Mr. Swenson graduated from the University of Illinois in 1899, and from June of that year until March, 1905, was in the engineering department of the Commonwealth Edison Company, Chicago. He was later with the New York Central for two and one-half years, and worked in connection with the electrification of that company's lines around New York. From August, 1907, to July, 1911, he was assistant electrical engineer of the Detroit River Tunnel, and was engaged in engineering work in connection with the electrification of the Michigan Central between Detroit, Mich., and Windsor, Ont.

TRADE PUBLICATIONS

MACHINE TOOLS.—The National Machinery Company, Tiffin, Ohio, in National Forging Machine Talk No. 8 illustrates and describes the new method used in the company's heavy-pattern forging machines of aligning heading slides.

OXYGEN AND HYDROGEN GENERATORS.—Catalogue No. 3 recently issued by the International Oxygen Company, New York, deals with the I. O. C. Bipolar oxygen and hydrogen generators. The book touches upon the advantages of using the generators as against buying the oxygen or hydrogen in tanks. It also deals with the growing use of hydrogen and considerable space is given to the economy, flexibility, etc., of I. O. C. Bipolar apparatus and to the purity of the gases generated by it. The latter half of the booklet goes into detail concerning the design of the generators and the generation of the gases. The book is well illustrated and well printed.

CORROSION RESISTANCE OF COPPER STEEL.—The American Sheet & Tin Plate Company, Pittsburgh, Pa., has issued a 22-page booklet entitled, "Research on the Corrosion Resistance of Copper Steel," by D. M. Buck, metallurgical engineer, American Sheet & Tin Plate Company, Pittsburgh, and J. O. Handy, director of laboratories of the Pittsburgh Testing Laboratory, Pittsburgh, describing the results secured from elaborate tests on full size sheets of copper-steel alloy. These tests show that steel or iron containing copper shows greatly increased corrosion resistance when exposed to atmospheric conditions, the most effective amount of copper for this purpose being approximately 0.25 per cent. This book is valuable to any one interested in this subject.

SPANISH RAILWAY SALE.—The executor of the late Senor Bosch lately negotiated in Madrid the sale of the Spanish Southern Railways to an American company, which will undertake the working of the mines in the provinces of Granada and Almeria, and will extend the railway system.

HIGH SPEED DRILLS.—A fact often lost sight of, even by experienced users of drills, is that cutting ability and hardness are not the same thing. This is especially true of high-speed drills, the apparent hardness of which varies with the composition of the steel, and is no indication of cutting ability. Some of the best high-speed tools ever tested could be filed so readily that if this were any indication of the work to be expected of them they would be condemned without a working trial. A high-speed drill that cannot be filed may, by exercising the greatest care, be made to drill extremely hard material successfully; but for softer materials, or where a large amount of work must be done in a given time, it will be found so brittle as to be worthless.—*The Engineer.*

Railway Construction

BALTIMORE & VIRGINIA.—This company plans to build a single track railroad between Millersville, Md., and Drum Point, on a roadbed which had previously been partially graded, a total of 65 miles of main line and sidings. The maximum grade will be 1.25 per cent. The principal commodities to be carried will be oysters and fish, farm produce, wood, lumber, lime and miscellaneous freight. David B. Stewart, president, 216 Light street, Baltimore, Md.

MANHATTAN, TOANO & NORFOLK.—Under this name a new line is projected to connect Norfolk, Va., and West Point, about 67 miles. It will traverse the counties of New Kent, James City, York and Elizabeth City, thence by water connection to Norfolk. It is understood that the construction of the new line depends upon the building along the proposed route of a new powder plant on the York river by the du Pont interests. Dr. H. U. Stephenson, Toano, president; F. M. Sprague, Washington, first vice-president; J. A. Pitts, Barhamsville, second vice-president; E. D. Patterson, Chase City, third vice-president; J. W. Jennings, Toano, treasurer.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—Double tracking has been completed between Tantallon, Tenn., and Sherwood, for a distance of two and one-half miles. Additional trackage has also been put in at Sherwood.

PENNSYLVANIA RAILROAD—A short branch is to be built by this company for the Valley Camp Coal Company. It will extend from Parnassus, Pa., on the Conemaugh division southeast, and will be 1.5 miles long.

SOUTH DAKOTA ROADS.—A line is projected from Mitchell, S. D., northwest to Pierre, about 150 miles. G. W. Adams, Council Bluffs, Iowa, has already secured subscriptions from farmers along the proposed route in aid of the project.

The promoters of the line to be built from Huron, S. D., northwest via Sisseton to a point in Minnesota, expect to complete work on the section from Huron to Sisseton, about 125 miles, during 1916. Much of the right of way has already been secured. W. E. Morrow, Huron, is the principal promoter.

The farmers in Perkin county, S. D., have under consideration the question of building a line to connect with the Chicago, Milwaukee & St. Paul, or with the Chicago & North Western.

The two independent companies, which were incorporated under the names of the South Dakota & Western and the South Dakota Western, to build a line from Mitchell via Platte in Charles Mix county, to a point in Brule county near Chamberlain, about 80 miles, have applied to the South Dakota Railroad Commissioners to decide which company has the right of way.

TUCSON, CORNELIA & GILA BEND.—This railway, extending from Cornelia, Ariz., through Childs, Midway and Black Gap, to Gila, has been completed. Daily mixed train service was inaugurated on February 20. The road is 43.28 miles long, and is operated by steam motive power. It was built principally to handle the output of large copper mines in that region. L. D. Ricketts, president, Warren, Ariz.; R. H. Jones, chief engineer, Gila Bend, Ariz.; R. L. Caldwell, superintendent, Cornelia, Ariz.

UNION PACIFIC.—This company will change its line between Wahsatch, Utah and Emory, a distance of about 10 miles, to allow for the construction of a second track. The new lines will call for a 60-ft. per mile grade for eastbound movements, whereas the grade of the present line is 92 ft. per mile. The construction work will be heavy, involving considerable rock work. The contract for all grading work has been let to the Kilpatrick Brothers & Collins Contracting Company of Beatrice, Neb. Work is expected to commence at once with a view of completing the line during the present calendar year. R. L. Huntley, chief engineer, Omaha, Neb.

WISCONSIN & ILLINOIS.—The Railway Contracting & Equipment Company, Great Northern building, Chicago, Ill., has the contract for the construction of this railway, which will extend from Mt. Hope, Wis., to Stockton, Ill., 115 miles. The road will pass through Lancaster, Wis., Platteville, Shullsburg, and Apple River, Ill. It will connect with the Chicago & North Western at

Lancaster and Platteville; with the Chicago, Milwaukee & St. Paul at Platteville and Shullsburg; with the Illinois Central at Apple River, Ill.; and with the Chicago Great Western at Stockton, Ill. Work will be started on the first section of the road, from Lancaster northwest, through Bloomington, Wis., and Patch Grove, to Mt. Hope, as soon as weather permits. This will be a single track line, 28½ miles in length, and will involve the use of about 70,000 ties, for which the construction company is now in the market. Two 100-ft. steel spans will be constructed between Lancaster and Bloomington. The heaviest grade is 2½ per cent, and a total of about 250,000 cu. yd. of material will be handled on the 28½ miles. The road will be operated by gasolene motive power exclusively.

RAILWAY STRUCTURES

ALTOONA, PA.—The Pennsylvania Railroad will build a new transfer station at Altoona, to have six tracks, with standing room for 262 cars. The improvements include two transfer sheds 15 ft. by 600 ft. each, with a two-story office building, including rest rooms for employees, also the placing of two 6-ft. concrete pipes and one 20-ft. span concrete slab bridge at the crossing of the Little Juniata river. It is proposed to erect a two-story brick freight office on the site of the present transfer. All the work will be carried out by the company's forces.

BALTIMORE, MD.—The Canton Company has accepted plans, it is said, for the construction of a pier leading out from its property at the foot of Third street, in the Canton district, and construction work will be started in about 30 days. The pier will be one-story, 75 ft. wide by 500 ft. long, and will be connected with a slip so that one side of the pier will have a length of 900 feet. The pier will permit the docking of four ships at one time, and will be equipped with all the latest loading and unloading devices. It will be especially constructed to handle ore and shipments of that character, but will also be adapted for the use of all kinds of merchandise, and will be operated in connection with the Canton Railroad. An additional warehouse may be built in connection with the pier.

KINSTON, N. C.—The North Carolina Corporation Commission recently issued an order, it is said, requiring the Atlantic Coast Line and the Norfolk Southern, to file plans for a union passenger station, to be built at Kinston.

JERSEY CITY, N. J.—An officer of the Lehigh Valley Railroad is quoted as saying that the company is contemplating the erection in the southern part of Jersey City of a big freight terminal. The site, which lies on the Jersey shore off Ellis Island, comprises about 450 acres, and has a water frontage of about one-half mile.

LAMBERTS POINT, VA.—A contract has been given to James Stewart & Co., Inc., New York, for the piling, dredging, concrete work, etc., for two warehouse piers to be built at Lamberts Point. One of the piers will be 222 ft. by 800 ft., and the other 222 ft. by 1,195 ft. The work is now under way.

OLD SAYBROOK, CONN.—The New York, New Haven & Hartford will build a plate girder span, 64 ft. long, with a 20-ft. roadway, over Schoolhouse Crossing at Old Saybrook, at a cost of $6,350. The contract for fabricating and erecting the steel has been let to C. A. Sibley, New Haven, Conn.

OMAHA, NEB.—The Union Pacific will soon reconstruct its double track bridge across the Missouri river between Omaha and Council Bluffs, Iowa, at an approximate cost of $1,000,000. The work will involve the placing of 4,500 cu. yd. of concrete and the use of about 5,200 tons of steel. The foundation work will be done by company forces, and the contract for the erection and fabrication of the superstructure has been awarded to the American Bridge Company. The superstructure will consist of four through pin-connected Pratt truss spans, 246 ft. 3 in. in length; one through riveted Pratt truss span, 129 ft. 6 in. long; two through riveted Pratt truss spans, 120 ft. 9 in. in length; four deck plate girder spans, 67 ft. long; two deck plate girder spans, 50 ft. long; two towers and one bent. R. L. Huntley, chief engineer.

TRENTON, N. J.—Pennsylvania Railroad has plans made for abolishing grade crossings at Whitehead Road on the New York division in Mercer County. The work calls for an overhead structure 270 feet long, to be of steel and concrete construction. The work will be started in the near future.

Railway Financial News

ATLANTA & CHARLOTTE AIR LINE.—See Southern Railway.

CHESAPEAKE & OHIO.—This company is to offer to its stockholders at 97½ an issue of bonds limited to $40,180,000, bearing interest at 5 per cent and convertible into common stock at 75, to and including April 1, 1920; thereafter at 80, to and including April 1, 1923; thereafter at 90, to and including April 1, 1926, and thereafter at 100, to and including April 1, 1936. Kuhn, Loeb & Co. and the National City Bank, both of New York, are forming a syndicate to underwrite the bonds.

The Chesapeake & Ohio has $33,000,000 5 per cent 5-year notes maturing in 1919. It is proposed to take these notes with part of the proceeds of the present bond sale. The indenture securing the notes provides that a certain amount shall be taken from net income before the payment of dividends and spent for capital purposes. In the fiscal year ending June 30, 1916, this amount is $3,000,000, and the proposal to take up the notes through the issue of these bonds will not affect the appropriation for additions and betterments for this current fiscal year. Taking up the notes, however, will relieve the road of the obligation of making the appropriations in 1917, 1918 and 1919, but while such appropriations will no longer be obligatory, it is understood that there will be no change in the policy of making adequate provision out of surplus earnings for property additions and betterments. The board of directors has agreed to adopt a policy of setting aside out of income amounts necessary to provide for amortization through the conversion into stock at prices below par. The amounts so appropriated from income will be expended on property and equipment accounts.

ERIE.—The directors have authorized, subject to the approval of stockholders and the consent of the state commissions interested, the sale of $19,627,130 general mortgage 4 per cent convertible bonds, series D, convertible at par after April 1, 1918, up to October 1, 1927, into common stock at 50. Stockholders and holders of the outstanding, series B, general mortgage 4 per cent convertible bonds are to be given the right to subscribe for new bonds at 85 to the extent of 10 per cent of the stock registered in their name, or 16⅔ per cent of the principal amount of the series B bonds.

SOUTHERN RAILWAY.—A syndicate, headed by J. P. Morgan & Co., is offering $7,000,000 Atlanta & Charlotte Air Line first mortgage 5 per cent bonds, series B, of July 1, 1914-1944, at 103, yielding 4.80 per cent on the investment. These bonds are part of a total authorized issue of $20,000,000, of which there are now outstanding, including the present offering, $16,000,000. The bonds are secured by a first mortgage on the main line of the Southern Railway, running from Charlotte, N. C., to Atlanta, Ga., 263 miles. The Atlanta & Charlotte Air Line Railway is operated by the Southern Railway under a contract in the nature of a lease under which the Southern Railway is to pay in perpetuity interest on the Atlanta & Charlotte Air Line debt as constituted from time to time, and dividends of 9 per cent on the Atlanta & Charlotte Air Line stock. The proceeds of the present sale of bonds are to be used to carry on the work of line revision and double tracking. The principal section now to be undertaken is between Central, S. C., and Cornelia, Ga.

RAILWAYS IN NYASALAND.—The Central Africa Railway (3-ft. 6-in. gage) was completed by Pauling & Co., engineering contractors, with the exception of the wharf at Chindio and station buildings, and opened for public traffic in May, 1915. The wharf and station buildings are now being completed by the railway staff. Since the opening of the railway it has proved exceptionally useful in the transport of troops for the fighting front in Nyasaland, and also for the equipment and supplies for the forces engaged against German East Africa. The receipts are steadily increasing month by month. The line is being worked by the Shire Highland Railway under an agreement for at least 10 years.

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WE GUARANTEE, that of this issue, 5,631 copies were printed; that of these 5,631 copies, 4,955 were mailed or delivered by messenger to regular paid subscribers to the weekly edition; 127 were distributed among members and guests of the Railway Signal Association and at the Coliseum; 400 copies were provided for office use to fill future orders; 83 copies were mailed to advertisers and 66 copies were mailed as samples.

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The Highest Mark Yet Reached

It is not an uncommon thing for The Daily to say of the American Railway Engineering Association convention that it was the best ever held. It is usually possible to say this truthfully, because year by year the conventions ordinarily get better. But the statement can be made as to the 1916 convention with more than the usual emphasis. The attendance exceeded that of any previous year. Most of the committee reports were of a high character. The discussions and the action taken on the reports were more than ordinarily courageous and illuminating. Last, but by no means least, President Trimble's address and his performance of his duties as a presiding officer were able and admirable. The American Railway Engineering Association is one of the greatest organizations in the railway and engineering fields, and its meeting, which closed yesterday, touched the highest mark yet reached.

A Comparison of Ballast Materials

In presenting a classification of ballast materials, ranking each in the order of its superiority, a committee lays itself open to criticism arising from differences of opinion. Many men will not agree with the committee in its conclusion that the most efficient ballast is stone and that cinders should stand at the foot of the list, as is shown by the fact that one Western road has covered a considerable mileage of broken stone with gravel and another has covered a large amount of gravel with cinders during the past two years. Broken slag, chatts and gumbo are available in such a small part of the country that they are not to be considered on most roads. In general, the selection is limited to stone, gravel and cinders and frequently one of the first two is absent. The efficiency of a ballast depends to a considerable extent upon roadbed and traffic conditions, and these vary so widely on different lines that it would appear difficult to justify this conclusion of the committee for the roads in general. The character of the materials varies even more widely, and clean, sharp gravel may and frequently does provide a more satisfactory ballast than a soft stone. In general the rating of the committee will be accepted, but it may be misleading if applied to any particular local conditions.

The Work of the Rail Committee

In his statement to the American Railway Engineering Association, published in another column, President Trimble reviewed the work which the Rail Committee has done during the last five years. This report is of particular interest to the members of the Engineering Association, presenting as it does a general statement of the work of this committee. The committee has conducted a large number of careful experiments to determine the influence of various elements and conditions on rail manufacture. However, more important than this has been the presentation of a united front to the manufacturers, who have maintained harmony of action for a number of years. Important as

many of the purely metallurgical problems are in rail manufacture, it would seem that the Rail Committee, with its salaried investigator devoting his entire time to the work, and with the backing of nearly all the railroads, might take a more important part in the investigation of transverse fissures, which is the most serious rail problem now confronting the railways. With the increasing number of transverse fissures, their widespread distribution over the country and the serious results which have been occasioned by them in some instances, it would seem that the Rail Committee might give this its careful attention for some time, particularly in view of the lack of agreement among the various authorities at present as to their cause. The Rail Committee has spent over $42,000 in the last five years, and is asking for an annual appropriation of $10,000 for the next five years. With this support the committee might well undertake the detailed investigation of this subject at the present time.

Co-operation in Committee Work

A number of reports presented this year contain references to the co-operation of the committees of the American Railway Engineering Association with similar representatives of other associations engaged in the investigation of subjects of common interest. This is particularly true of the work of the special committee on The Grading of Lumber. This committee has been co-operating with the United States Forest Service, the American Society for Testing Materials and the manufacturers of Southern yellow pine, in the preparation of definitions for Southern yellow pine. This committee has also co-operated with other committees of the American Society for Testing Materials, in the preparation of specifications for bridge timbers to be creosoted. This is an excellent indication of a broad spirit on the part of these committees which might well be manifested more generally by other committees, not alone of the American Railway Engineering Association, but of other railway associations as well. With the number of technical associations now existing there is bound to be some overlap in their work unless great care is exercised. The desirability of avoiding needless duplication of work is fundamental. Co-operation in investigation also insures uniformity of results. Particularly in the preparation of specifications is this important, for the existence of two or more specifications inevitably leads to confusion and resulting difficulties. The increasing amount of co-operation evidenced in the work of the important railway associations is an evidence that they are making the desire to increase the prestige of their individual societies secondary to the accomplishment of the work for which the associations have been formed, namely, the promotion of knowledge of the various phases of railway activities.

A CONTINUOUS PROGRAM FOR COMMITTEE WORK

An examination of the reports of the committees which have been presented to the convention this year illustrates the continuity of the work of this association. At the same time, further progress can be made along these lines. The Board of Direction has given this subject careful consideration during the past year, and at its meeting yesterday afternoon the Committee on Outline of work presented a program which will require the attention of the respective committees for several years. In this way each committee can undertake its work more consistently and outline more elaborate programs.

There is also an opportunity for greater efficiency in the conduct of committee work on the part of the committees themselves. At the present time the personnel of the committees is not announced until April, and in most instances the committees do not organize until late in May, and it is necessary that they have their reports in the hands of the secretary by December 1. Most of the committees then discontinue work until new assignments are made the following April. In other words, active committee work is carried on only for about one-half of the year. If the Board of Direction can outline some plan by which the work of the following year can be undertaken after the report for one year has been completed some progress can be made. One of the problems connected with committee work is the holding of meetings at such points and times as to secure a large attendance of the members. At the present time very few of the members hold meetings during the convention, although more of the members are together than at any other time. If the program was continuous these committees could hold profitable meetings at some convenient time during the three days the members are in Chicago and materially promote their work. The Board of Direction is moving along the right lines and can well afford to give this subject its continued attention.

MOVEMENT OF TROOPS ON THE EL PASO & SOUTHWESTERN

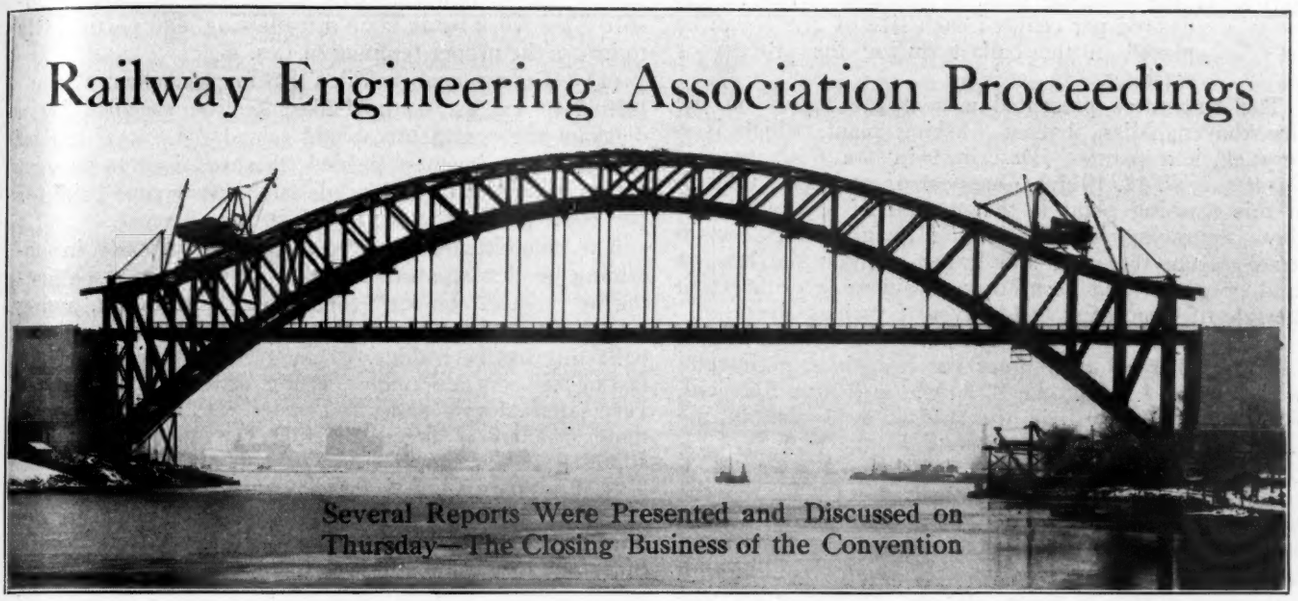
Practically all of the United States troops sent into Mexico in the "punitive expedition" against Villa, the bandit, were transported over the El Paso & Southwestern. J. L. Campbell, engineer maintenance of way of this road, told some interesting facts yesterday regarding the handling of the troops. Part of them were brought from Fort Huachua, which is 275 miles west of Columbus, the town which was partially destroyed by Villa and his raiders. U. S. troops were also received at El Paso and moved westward. The Rock Island delivered some detachments at Tucumcari, which were brought from the interior to replace troops which had been patrolling the border and which had been assigned to service in Mexico.

The moving of troops began on March 9, and the El Paso & Southwestern handled their equipment, horses and so on, within a week. All trains consisted of stock cars for the horses, flat cars for artillery and similar equipment, and passenger cars for the soldiers. Although the business suddenly delivered to the El Paso & Southwestern was large it was handled without any interference with the regular train schedules.

The line runs near the Mexican border. It has one tangent a few miles west of El Paso which is within 35 feet of the border and the telegraph poles of which are on the boundary line. Nowhere between El Paso and Naco is the distance from the boundary more than 50 miles.

Mr. Campbell was on an inspection trip with a party of company officers the night that the attack on Columbus was made, and the party was only 20 miles west of the town when it occurred. The Mexicans had plenty of opportunity to burn the bridges of the El Paso & Southwestern west of Columbus on the occasion of this invasion but did not do so. The road has a branch line into Mexico extending from Douglas to Nacozari, and this has been out of service repeatedly on account of the destruction of parts of it.

Railway Engineering Association Proceedings



Several Reports Were Presented and Discussed on Thursday—The Closing Business of the Convention

Hell Gate Arch, February, 1916

The Thursday morning session of the American Railway Engineering Association was called to order at 9:30 a. m. by President Trimble in the Florentine Room of the Congress Hotel, Chicago.

Report of Committee on Ballast

H. E. Hale, Chairman

The following subjects were assigned by the Board of Direction:

(1) Make a critical examination of the subject-matter in the Manual, and submit definite recommendations for changes.

(2) Report on the economical and efficient depth of ballast, co-operating with the special committee on Stresses in Railroad Track.

(3) Methods and cost of applying ballast — (a) Ballasting by contract. (b) Mechanical tamping and shoulder formings.

(4) Efficiency of various stone and gravel ballasts.

The efficiency of stone ballast is largely determined by the "physical tests of stone for ballast," which subject was thoroughly investigated by this committee several years ago and the tests, which were approved by the Association, are specified in the Manual. The committee has no changes in these tests to recommend.

The committee in its discussions for several years has felt that the old specifications for gravel ballast, "30 to 35 per cent. sand," were not sufficient, and that some further specifications as to the proportion of various sizes of gravel should be made. Stretches of track have been selected where the results from the use of the ballast were known, and samples of the ballast have been tested to determine the per cent. of various sizes of gravel used in the ballast as follows:

Per cent of material passing through screen with 1/10-in. mesh.

Per cent of material passing through screen with ¼-in. mesh and retained on screen with 1/10-in. mesh.

Per cent of material passing through screen with ½-in. mesh and retained on screen with ¼-in. mesh.

Per cent of material passing through screen with 1-in. mesh and retained on screen with ½-in. mesh.

Per cent of material retained on screen with 1-in. mesh.

The number of tests made are too few to arrive at a definite conclusion and it is the recommendation of the Ballast committee that a large number of similar tests, possibly 50 or more, should be made, as it is felt the result will indicate what per cent of each size of gravel will produce the best results. An effort has been made to classify different kinds of ballast in the order of their desirability. This has been found very difficult on account of certain ballast being considered best for certain conditions, whereas other kinds of ballast are considered most satisfactory for other conditions.

The committee recommends the following:

It is generally conceded that stone ballast, as defined by the Manual, is the most efficient ballast, and experience has demonstrated that the other ballast materials (using the definition for each as appearing in the Manual) should fall in the following order of efficiency:

(1) Stone.
(2) Broken Slag (not granulated).
(3) Gravel.
(4) Chatts.
(5) Burnt Clay or Gumbo.
(6) Cinders.

The efficiency of gravel for ballast, in the opinion of the committee, is much improved by washing, for the following reasons:

(a) Washing removes clay, dust and other undesirable materials.

(b) If the washing plant is properly arranged the desired per cent. of each size of gravel can be placed in the ballast during the process of washing.

The committee presented a complete report on the Brookhaven, Miss., ballast washing plant, which is a very efficient plant. (Described in the *Railway Age Gazette,* Nov. 17, 1911.) One part of particular interest in this washing plant is the method of separating the clay (appearing in considerable quantities in certain strata) from the sand and gravel without the loss of sand or gravel and permitting considerable profit from the sale of clean sand and gravel of various sizes.

METHODS AND COST OF APPLYING BALLAST

The mechanical tie tamper has been in experimental use on the B. & L. E., the B. & A., the Boston Elevated, the D. L. & W., the Erie, the Hudson & Manhattan, the L. V., the L. I., the M. C., the N. Y. C., the N. Y. N. H. & H., the Pennsylvania, the P. & L. E., the Q. & C., the St. Louis Merchants Bridge Terminal, the U. P. and the Washington Terminal.

The results of several tests of the use of the mechanical tie tamper were reported to the committee, but with the data available in these tests the committee felt unwilling to make any definite recommendations in regard to it.

The committee also described the Cafferty-Markle ballast former (described in the *Railway Age Gazette,* Sept. 17, 1915, page 529). It is of the opinion that the use of "formers" to shape the shoulder of the ballast, and also, to a large extent, the path adjoining the ballast, results in considerable economy. Up to the present time sufficient data have not been obtained as to the saving resulting from the use of these formers to make a complete report.

Ballasting by Contract

Ballast has been applied by contract on several roads. The Michigan Central has applied ballast by contract, as described in the *Railway Age Gazette* of June 18, 1915, page 1436, by John Evans, division engineer, Michigan Central, Detroit, Mich., and reprinted in Appendix A of the report.

The Missouri Pacific applied quite a large amount of ballast by contract in 1909 to 1911, the conditions being as follows:

(a) Certain ballast pits were specified in the contract as well as the location of the track to be ballasted, and the work of "loading, hauling and unloading of ballast per cubic yard, measured in the cars at the ballast pit," was paid for at a special price per cubic yard—the railroad furnished the ballast cars and spreaders and the contractor furnished the locomotives, steam shovels and all labor, including pay of train crew and supervision.

(b) After the ballast was applied on the track the "ballasting of track per cubic yard of ballast unloaded" was paid for per cubic yard at a specified price, the contractor furnishing all labor, tools and supervision.

(c) The ties which had to be renewed in the track that was being ballasted were renewed by the contractor, "including the necessary respacing," at a specified price per tie, "the ties to be furnished by the railroad," the contractor to furnish all labor, tools and supervision.

(d) The ballast section diagram was made a part of the contract and specified the dimensions of the ballast section. The railroad provided inspectors to report the amount of ballast loaded and the character of work done in ballasting. The number of ties to be renewed was determined also by the railroad inspector.

(e) The contract required that the track should be maintained by the contractor for a period after the ballasting was completed. This clause was inserted to insure good work being done in ballasting, and particularly to insure the proper tamping of ties.

(f) The contract provided that in case ballast was unloaded in excess of the ballast section specified by a diagram the contractor should reload the excess ballast and distribute it where needed; this was done to prevent excess ballast being unloaded, as the work was paid for per cubic yard.

The committee has had considerable difficulty in obtaining good comparative figures on the cost of ballasting by railroad company forces, and by contract, owing to the different track and other conditions existing where ballasting has been done. They feel, however, that ballasting by contract under certain conditions has given very satisfactory results, and under certain conditions is more economical than ballasting by railroad company forces.

THE ECONOMICAL AND EFFICIENT DEPTH OF BALLAST

Taking into account the three classes of roads as defined by the Manual, and their experience with the depths of ballast now standard with them, the chairman of the sub-committee took up with various roads, widely distributed as to geographical location, the question as to their present practice relative to ballast depths. The valuation engineers of several roads now in process of valuation were also requested to furnish information relative to the actual depths of ballast found, while tests were being made for that specific purpose, in connection with such valuation.

The number of replies to both requests was not large or distributed enough to warrant a tabulation, undoubtedly owing to the fact that only a comparatively few roads have as yet made any actual tests to determine the depths of the various kinds of ballast under each class of track. The replies from the several valuation engineers, while not giving a large amount of data, gave promise of some very valuable data for next year's report.

While the number of replies giving information as to depth of ballast found has not been large, it is surprising to note that in nearly every case the depth of ballasting materials given for Class "A" roads is at least equal to the 24 in. recommended by the committee. In several cases a much greater depth has been found. Taking into account the tests made in the past, the mathematical deductions as to proper depth, and the actual depths recently found in work of valuation, or in preparation therefor, the committee feels that it cannot do otherwise than reaffirm the conclusion that a combination of ballasting materials, approximately 24 in. in depth in the aggregate, is necessary to insure uniform distribution of the load on the roadbed.

It is recognized that roadbed materials differ widely, some not requiring uniform distribution of the pressure, others requiring an almost absolutely uniform distribution in order to avoid excessive distortion. As an example of the first may be cited the roadbed through a rock cut, where only sufficient ballast is necessary to provide drainage and allow for track maintenance work. Illustrative of the second is the extremely soft clay or muck roadbed requiring the most uniform distribution possible.

Conclusions

(1) Investigations now being carried on by the field parties of the Division of Valuation indicate that there is a much greater depth of ballast actually existing in track than has previously been supposed, and that while many standard plans of trunk line railroads show 12 in.

of ballast, the actual depth existing in their main lines is much greater.

(2) Recommendations of the Ballast committee, covering the depth of ballast of Class "A" track, should be changed to read as follows:

"On fills or roadbed material, subject to deformation, by the application of live load, the minimum depth of ballast, under the bottom of the tie, should be 24 in. Through rock-cuts or on material which will not be deformed by the application of live load, the minimum depth of ballast under bottom of tie should be 12 in., this 12 in. to serve as a cushion and not for the purpose of distributing the load transmitted from the tie to the roadbed uniformly."

(3) The committee again unanimously recommends that the test outlined in the 1913, 1914 and 1915 reports be made under regular traffic.

The committee recommends that the same subjects be assigned to the Ballast committee for 1916 as were assigned last year.

Committee: H. E. Hale (Pres. Conf. Com.), chairman; J. M. Meade (A. T. & S. F.), vice-chairman; L. W. Baldwin (C. of Ga.), D. P. Beach (P. L. W.), W. J. Bergen (N. Y. C. & St. L.), Carl Bucholtz (Erie), T. C. Burpee, O. H. Crittenden (I. & G. N.), J. M. Egan (I. C.), T. W. Fatherson (C. G. W.), H. L. Gordon (B. & O.), Geo. H. Harris (M. C.), C. C. Hill (M. C.), S. A. Jordan (B. & O.), William McNab (G. T.), S. B. Rice (R. F. & P.), E. V. Smith (B. & O.), D. L. Sommerville (N. Y. C.), F. J. Stimson (P. L.), D. W. Thrower (I. C.), R. C. White (M. P.).

Discussion

H. E. Hale (chairman): This is a progress report. There is one conclusion which the committee would desire to present. It is as follows: "It is generally conceded that stone ballast, as defined by the Manual, is the most efficient ballast, and experience has demonstrated that the other ballast materials (using the definition for each as appearing in the Manual) should fall in the following order of efficiency: (1) Stone; (2) broken slag (not granulated); (3) gravel; (4) chatts; (5) burnt clay or gumbo, and (6) cinders." I move that it be approved and inserted in the Manual.

G. J. Ray (D., L. & W.): Upon what ground did the committee come to the conclusion that broken slag should be placed ahead of gravel ballast?

Mr. Hale: That was the opinion of the committee. It was difficult to obtain any definite information, because the slag and the gravel are used under different conditions.

H. McDonald (N., C. & St. L.): Did the committee consider the different kinds of stone—there is trap rock, granite and limestone, each of which has under certain conditions an advantage over the other?

Mr. Hale: The work was not carried to that extent. The physical tests for stone ballast give the test which the committee recommends and the preference which should be given in each test as to the best ballast.

Mr. Ray: The committee has seen fit to qualify the broken stone by saying "(not granulated)." If that is to stand and go into the Manual there should be some qualification about the gravel ballast, for there are cases where the broken stone ballast available may be far inferior to the gravel ballast available. If gravel ballast is to be placed after slag ballast, it should be qualified to the extent that washed and crushed gravel should be eliminated from that order. I am certainly opposed to putting it in the Manual in that order.

The President: I think the question that has been raised by Mr. Ray is a very vital one.

Mr. Hale: The committee had some information in regard to comparative tests of stone and gravel ballast on the Baltimore & Ohio some years ago, in which a stretch of track of stone ballast was compared to a stretch of track, approximately the same length, with gravel. It appeared after investigation that when a certain amount of gravel had been obtained, it cost more to maintain it than the stone. However, we have not been able to obtain exact figures up to the present time.

Mr. Ray: I move that this entire conclusion be referred back to the committee for further consideration.

C. S. Churchill (N. & W.): In seconding that motion, I wish to state that the whole trouble arises from lack of descriptive matter referring to these different materials. There are many kinds of slag. There is gravel and gravel; some is good and some is not.

(Mr. Ray's motion was carried.)

Mr. Hale: In connection with the efficiency of gravel for ballast, in the opinion of the committee, ballast is much improved by washing. The committee wish to call attention particularly to the part of the plant which separates clean sand from the clay. They separated the gravel and a certain mixture of sand from the ballast and sold the clean sand. Another subject given this committee was methods and cost of applying ballast. We were fortunate to get reports from various roads as to results. The conclusion of your committee on mechanical tamping is ready for acceptance.

The President: We will accept that conclusion.

Mr. Hale: In regard to ballast formers, the committee was of the opinion that considerable expense might be saved by the use of ballast formers not only for forming the shoulders, but possibly the pad. The conclusion is presented as information.

The President: We will accept this as information.

Mr. Hale: The next subject is the cost of applying ballast by contract.

(The chairman then read the conclusion.)

J. G. Sullivan (C. P.): I have never seen any ballasting done on contract under the ordinary maintenance of the road. The ballasting of new work by contract costs less than it does to ballast a line in operation, for the reason that in new work the men are bunched, ready to let a train through. How long is the contractor permitted to delay a train if at all?

Mr. Hale: On the Missouri Pacific, where the ballasting is done by contract, it was done under the same rules which govern any ballasting by any force. There were the usual disputes with the contractor, but they were settled.

R. H. Ford (C., R. I. & P.): The contract on the Missouri Pacific called for something different from what the Michigan Central contract did, in that the loading, hauling and applying the ballast on the Missouri Pacific was done by contract. There was no difficulty with the trains. The contractor had to be ready to let the trains through on the regular schedule and keep his track in such shape that he could do it. I think the conclusions of the committee are entirely correct. The situation is no different in respect to ballasting than it is with regard to other piece work, but the results secured, under general conditions of contract ballasting, are better than are ordinarily secured under the regular method of ballasting with the company force. The margin of profit is very

favorable in so far as the work relates to work done by contract.

The President: Do you know of any cases where the cost of doing the work by contract was greater than the cost of doing it under the regular railroad plan?

Mr. Ford: Yes, where the material used under the contract was so close to where the ballast was being applied that the railroad was in a position to get better results than could possibly be attained if the work was done by contract. In amplification of what I have said, the contract, as referred to by the chairman, provided for an average haul of 90 miles. The contractor supplied his own equipment, except in one or two cases where the railway company found that it could better supply the equipment. The cost in round figures was 30 per cent less than what the railroad company had actually been paying for the same work. This, however, will bear still further investigation, because the new money which the railroad company did not expend was added to that cost; but even with that reduction the margin is so great as to have caused in my mind a grave question as to the wisdom of railways undertaking to ballast the railroads in the way that it is so generally done today.

C. W. Baldridge (A., T. & S. F.): How long is the contractor required to maintain the track in good order?

Mr. Hale: The contractor was required to maintain the track until it was accepted, and there was a general time stated.

Mr. Ford: It depended altogether upon the condition of the track. The purpose was to have the track under the first lift—two lifts were given, a rough and finished lift—under operation long enough so that the track was permanently set, and when the finishing lift was done that it would remain in the finished surface.

C. E. Lindsay (N. Y. C.): Is the work done under the protection of a slow order and, if so, how can we delegate to the contractor our responsibility for the safe and uninterrupted passage of trains, and what recourse would we have from such a contractor if there was an accident?

Mr. Hale: Ballasting by contract is done, in some cases, without slow orders, but in many other cases they have been put on.

Mr. Ford: There is absolutely no difference in ballasting under contract and under the usual operations in that particular. The work is under the supervision of an inspector, as the chairman of the committee has stated, and to all intents and purposes he might be an assistant roadmaster.

Mr. Hale: The next subject was to report on the economical and efficient depth of ballast, co-operating with special committee on Stresses in Railroad Track. The committee was able to obtain some very interesting information on the depth of ballast found in valuation work, which it was not able to get in shape to give to the association. The committee hopes to have a much greater amount of information on this subject to present next year.

(The chairman read conclusion No. 2.)

The President: Please tell us wherein that differs from our present recommendation?

Mr. Hale: In the latter part, in the case of roadbed, which will not be deformed by the application of live load, the minimum depth of ballast recommended is 12 in., instead of 24 in. as previously recommended in the Manual.

Mr. McDonald: I suggest that the word "clean" be inserted ahead of the word "ballast."

The President: The committee will accept that.

Mr. Churchill: I move that all these conclusions be received as information and not go into the Manual, as the committee on Track Stresses is working on this same subject.

The President: Conclusion No. 2 is the one referred to in Mr. Churchill's motion.

(Mr. Churchill's motion was carried.)

The President: As to conclusion No. 3, that is a matter to be referred to the Board of Direction.

(The committee was excused with thanks.)

Report of Committee on Track

The committee has made a critical examination of the subject-matter in the chapter on Track in the Manual, and considers that, in view of the thorough and comprehensive revision which was made last year, no further changes should be recommended until after the new edition of the Manual has been published.

J. B. Jenkins, Chairman

Economics of Track Labor

This report is necessarily one of progress only, because the magnitude of the subject undertaken by the committee this year is such that we can report only having started, in a systematic way, to collect data from test sections which will form a basis for the committee's subsequent study. The work which the committee has done this year may be briefly stated as follows:

(1) It has received from 18 railroads very good data in the form of records of test sections, which data has now extended over a period of 12 months. This data has been submitted in accordance with the form prepared last year and placed in the hands of the members of the Association.

(2) The sub-committee sent out, under date of August 19, a further appeal not only to the railroads which had signified their intention of co-operating, and which have kept the desired record for a year, but to a number of other roads which we had not been able heretofore to interest, and we are hoping that our appeal will bring forth good results.

(3) The sub-committee prepared a chart, a copy of which is attached hereto, outlining a suggested method of analyzing results of track sections. This chart enabled a relationship to be established between units of labor performed and the physical characteristics.

The sub-committee decided to divide the results of the years 1914-15, which have been submitted by the railroads keeping test sections, among the various members; each one will take the records of certain roads and make

an analysis of the results, and, at the next meeting of the sub-committee, these results will be discussed and an effort made to reach some conclusion, but it may be expected that another year's record should be taken of these test sections before any tangible results can be reached, owing to the numerous factors which enter into this problem and which vary from year to year.

It is felt by the sub-committee that the first step to be taken in analyzing the test section records will be with the view to establishing values of certain physical characteristics, expressed in units of labor or man-hours. After this feature has been covered, the next step would seem to be the application of these results to the subject of adjusting section lengths.

Out of this second subject will naturally spring a study of the situation for the purpose of establishing, on a broader basis, a method of apportioning maintenance of way expenses with reference to larger districts, special attention being given to the matter of attempting to work out values with reference to traffic and climatic conditions. In other words, the problem will be to attack the whole question in a logical manner, starting with the simplest factors.

One of the railroads, represented on the sub-committee, has already undertaken to make a systematic study of the subject of establishing proper lengths of sections, by making allowance for the various things which influence expenditure of labor.

As to the work of the sub-committee for next year, it would recommend that it be permitted to continue the subject in hand, without taking on any other work, as the sub-committee is becoming more and more impressed with the magnitude of the subject and feels that all of its time can well be devoted to it.

Relation Between Worn Flanges and Worn Switch Points

The subject assigned was, "Study the relation between worn flanges and worn switch points, with a view to correcting the causes and decreasing the number of derailments due to the combination of worn switch points and worn flanges on wheels."

The committee has been conducting some investigations since this work was assigned, and during the period to date we have examined at least 1000 switch points to determine if the proposed rule suggested by the committee last year was adaptable to the conditions, and would result in determining whether a switch point had reached the condition where it should be removed from the track.

The rule as suggested was as follows:

A switch point should be removed when it is so worn that the greatest distance from the worn switch point to a straight line 24 in. long from any point on the gage line of the switch rail to a point on the gage line of the stock rail equals ½-in.

We have applied this rule to a number of badly worn switch points, which had reached the condition where it was necessary to remove them from the track. In no single case had the application of the aforesaid rule indicated that it was necessary to remove these points from the track. As a matter of fact, however, the condition had been reached where it would have been undesirable to allow these points to remain in service any longer.

An alternative rule proposed by Mr. Leighty read as follows:

When the line of wear makes an angle with the gage line projected, equal to, or greater than, "A"=½-in., "B"=8 in., the point shall be removed.

The application of Mr. Leighty's rule works out no better than that suggested by the committee.

It is apparent that the degree of wear that subjects a switch point to removal differs for every known condition. There are so many more or less vital factors involved and to be considered in the determination of any fixed rule as to the safe limit of wear upon a switch point, that it is our belief that any such general rule might be easily outweighed or lost in the preponderance of exceptions and assumptions.

The M. C. B. rule fixes within certain limits the permissible flange wear, as well as the gage of wheels, and the combination of a partly worn wheel and a partly worn point, with or without a modifying or contributary condition, may or may not result in a derailment. It is fair to assume that generally, where a switch point approaches the limit of permissible wear, the balance of the switch lead or main track portion thereof is measurably worn, and that factors such as the gage of track, gage of wheels, wheel centers, track centers, or rigid wheel base, wheel loading, condition of loading, freedom of rotary motion of the truck or trucks, curvature, superelevation, etc., tending to increase or decrease the side pressure of the flanges or the vertical loading, also contribute in assisting the wheels to mount the point. This may be further modified by the speed of the car, train or engine, the stiffness of the rail and the nature of the service the switch is supposed to perform. In fact, there does not seem to be any theoretical basis upon which a definite rule can be established, and the practical tentative rule of a ½-in. ordinate, in a 24-in. chord, as the limit in any position throughout the lead along the gage line seems sufficiently general and practical to cover ordinary conditions. On the other hand, there are ample cases where even this limit would not be permissible, and certain conditions where the limit might be safely increased. It makes a very great difference whether the switch lead is from a straight main track or from the high side, or to the low side of the curve, as well as the degree of curve and the switch angle and frog angle; also whether the switch leads from a lateral track or from a base line or yard track.

It might be safe for the service intended and generally used in a yard, but not safe for certain classes of road engines which may never be called upon to use the switch, owing to the condition of curvature or clearances. In high-speed tracks no element of risk may be taken nor made, nor is economy considered, while for laterals or yard tracks under slow speed, more reasonable wear may be obtained without undue risk, taking into consideration the nature and frequency of the service, intricacy of track system, power employed, etc.

It is our opinion that it is going to be impossible to formulate any rule that will, even in a remote sense, cover the conditions aimed at. As in the past, it is going to be necessary to rely upon the judgment of the track foreman and supervisor to determine when a switch point in a given location has reached the point where it must be removed from the track. Any rule that we might adopt would doubtless lead to extravagance in some directions and entire neglect to prevent accidents at others. The latter fact being due to the necessity in any case of taking into consideration the local conditions obtaining.

The committee recommends that it be relieved from further consideration of the subject.

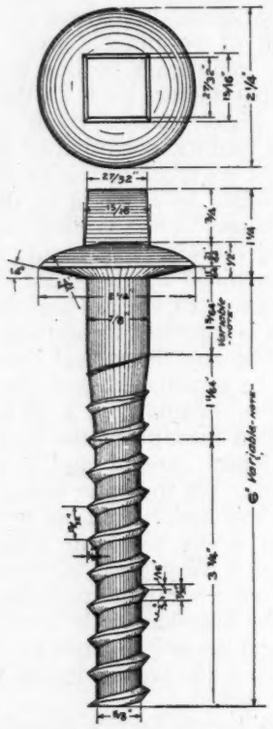
Specifications and Designs for Cut- and Screw-Spikes

The subject assigned to this committee was, "Review specifications and present designs for cut- and screw-spikes."

A circular letter was sent to roads represented in the Association to ascertain the extent to which the Association's specifications have been used in the purchase of the

spikes and for the further purpose of securing information as to recommended changes in the specifications and designs for both cut- and screw-spikes and data concerning dimensions and specifications of screw-spikes now in use.

From the tabulated list of replies received from the members, it is noted that but two or three of the roads reporting are using the American Railway Engineering Association specification for cut-spikes. A careful investigation of the general points in the specifications in



Recommended Design of Screw Spike

use shows that these specifications are not materially different from the American Railway Engineering Association specifications.

The latter specification was adopted by the American Railway Engineering Association after careful study of a similar set of replies from the members of the Association. The committee does not at this time see any good reason for changing the present standard specifications other than to make a few minor changes which will not materially affect the adopted standard. We submit herewith a design for a cut-spike, which we recommend as a standard to be adopted by the Association.

The head of the cut-spike is designed to take the blow of the hammer directly over the axis of the spike and thus mimimize the damage to spike-heads and the danger of breaking the head off during very cold temperatures. The tilting downward of the nose gives a stronger, more rugged construction, and assists in giving an easier clearance in the spike machine. It also permits the pulling of the spike more readily with the clawbar.

The reinforcement is symmetrical; that on the back of the neck having been used originally as it now is with many roads to force the spike forward against the base of the rail when driving, but we have added the reinforcing on the front of the neck in order to give additional metal to withstand rail wear and necking of spikes, which has been prevalent with the old flat plate.

It is required that the physical test be made on the finished spike. There seems to be a tendency to have the test made on the bars from which spikes are manufactured; therefore, we recommend the following changes in the specifications for ordinary track spikes:

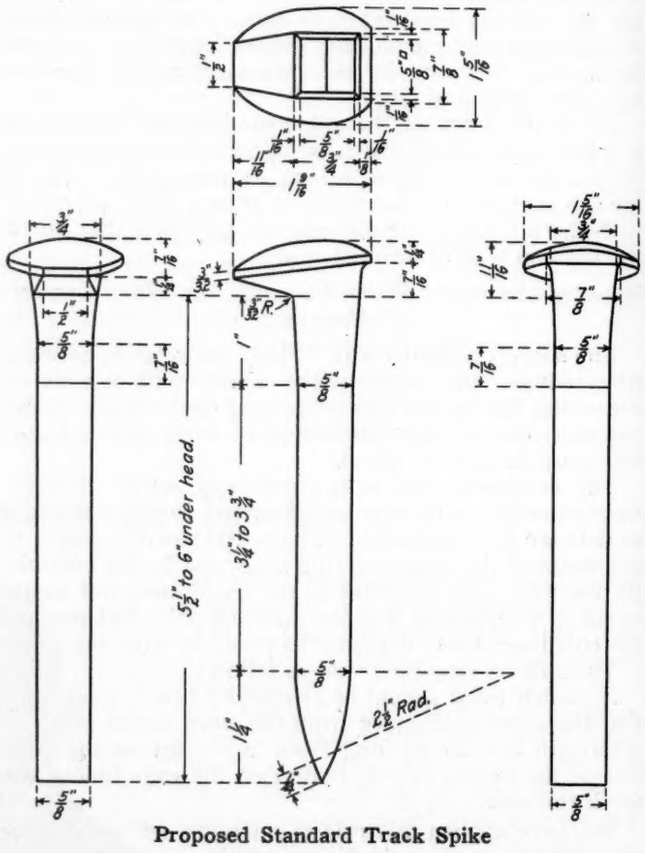
Elongation, not less than 20 per cent. in 2 in., or if the test is made on bar, 25 per cent. in 8 in.

When cold, the head of the spike must bend backward till the underside is in line with the body without sign of fracture.

The length under the head shall not be less than the dimension shown, nor shall it be greater than ¼-in. more.

From the replies received from the members of the Association, and from our study of the specifications for screw-spikes formerly adopted, we do not feel warranted in recommending any changes whatever in the present specifications.

We submit herewith a design for a screw-spike which we believe the Association will be warranted in adopting as a standard. This form of spike is now in use by two or three roads making more or less use of screw-spikes, and, so far as information is available, they have given satisfactory results. It will be noted that the distance from the underside of the head to the beginning of the



Proposed Standard Track Spike

thread is variable. This distance will vary with the thickness of the tie plate and rail base.

It is well known that the use of the screw-spike is very limited at the present time. The committee feels that now is the time to adopt a standard form of screw-spike so as to eliminate, as far as possible, the different forms of thread which are sure to be used as the use of screw-spikes becomes prevalent. After a form of thread has once been adopted and generally used on any road it would be a very serious thing to change the form of pitch of the thread, as new spikes could not be placed in old holes without destroying the thread in the wood.

The other features of the spike are not so important and may be varied at will without serious results.

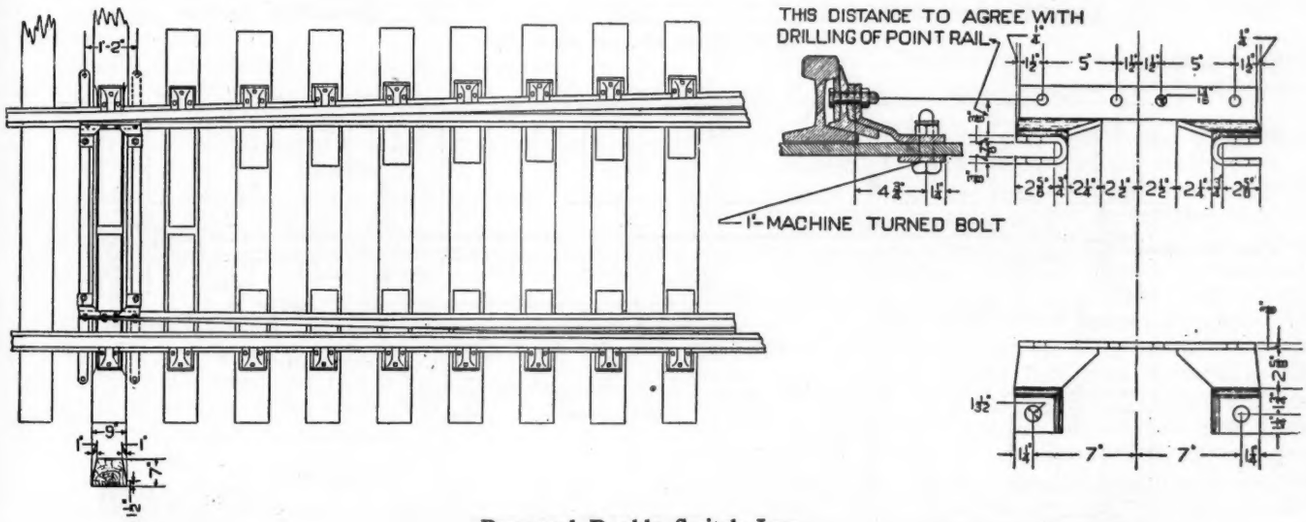
Increased Thickness of Wheel Flange

Design of Manganese Frogs and Crossings

The two subjects, "Report on guard rails and flangeways and the effect of an increase of ⅛-in. thickness of wheel flanges," and "Continue the study of the design of manganese frogs and crossings," were assigned to a single sub-committee for the reason that there was danger of some conflict in the requirements of the design of manganese frogs and crossings and in the flangeway requirements for thicker wheel flanges. The committee has no recommendations to make at this time excepting that these two subjects be reassigned for consideration next year.

Typical Plans for Double Slip Crossings, Double Crossovers and Guard Rails

During the present year, in addition to our regular assignments, we have designed a double switch lug. It is our opinion that with this lug a switch may be operated safely by using either rod as a throw rod and the other as a lock rod. This lug is so designed that it will not be necessary to have rights and lefts and it will reinforce the point sufficiently to prevent locking of switch with any obstruction, of sufficient size to be dangerous, behind the point. The spacing of bolt holes for this lug corresponds to that already adopted and published in the Manual. The use of this switch lug will permit throwing the switch by either rod with equal safety and give sufficient space between to minimize trouble from snow and ice.



Proposed Double Switch Lug

At the 1914 convention progress was reported on plans for double crossovers or scissors, and at the 1915 convention drawings of typical layouts for Nos. 8, 11 and 16 double crossovers for 13-ft. track centers were submitted. Attention was called to the unsymmetrical arrangement of crotch frogs, the object of which was to properly guard the frog and crossing points, which is difficult and sometimes impossible with the symmetrical arrangement. Attention was also called to the possibilities of using parts of these drawings when different track centers were required, thus making it possible to use the same layout in part for either 12- or 14-ft. centers. These drawings were received as information by the Association. For the present year we have prepared drawings of typical layouts of Nos. 8, 11 and 16 double crossovers or scissors for 15-ft. track centers, which were made to conform as nearly as possible with those for 13-ft. track centers. In all of the above plans we have followed as closely as possible the plans of frogs, switches and turnouts already adopted in order to avoid unnecessary conflict.

At the 1914 convention we submitted as information typical plans of Nos. 8, 11 and 16 double slip crossings, also a plan by the C., C. & St. L. for a No. 8 double slip crossing, the feature of which was the staggering of the switch points. At the 1915 convention we submitted drawings of typical layouts for Nos. 8, 11 and 16 double-slip crossings to be operated by interlocking. Attention was called to the staggering of switch points to provide for interlocking rods. These plans were referred back for reconsideration and co-operation with members of the Railway Signal Association.

For the present year we have revised the plans of double slip crossings. The changes are in the location of the insulated joints and removing of all joints from a ten-foot section at the center. All double-slip crossings of either design may be operated by hand or by interlocking, as may be desired. In the above plans we followed closely the plans of frogs, switches and turnouts that have been adopted. The double lug has not been taken into consideration on these plans, as it has not been adopted, but should it be, it could be applied with a few minor changes.

The committee has compiled data of present practice of American railroads as to dimensions of frog guard rails and offers a definition and specifications for frog guard rails, together with plans for an 11 ft. guard rail for a No. 8 frog, and a 16 ft. 6 in. guard rail for Nos. 11 and 16 frogs. We recommend the adoption and publication in the Manual of the definition, specifications and plans.

Definition

Frog Guard Rail.—A rail or other device to guide the wheel flange so that it is kept clear of the point of the frog.

Specifications

(1) Rail: No. 2 rail may be used.

(2) The base of guard rail is to be planed to provide a clearance of ⅞-in. between the base of the main rail and the base of the guard rail.

(3) The flangeway is to be 1¾ in. on standard gage track.

(4) Separators shall be of malleable iron or cast-steel.

(5) Solid metallic foot guards shall be of cast-iron,

malleable iron or cast-steel. Strap foot guards shall be of rolled steel. Wooden foot guards when used shall be of sound white oak.

(6) Bolts shall conform to the recommended specifications for frog bolts.

(7) Rail braces may be used in place of clamps.

(8) For all new work, 11-ft. guard rails are recommended for frogs up to and including No. 10, and 16½-ft. guard rails for No. 11 frogs and over.

Tests of Tie Plates Subject to Action of Brine Drippings

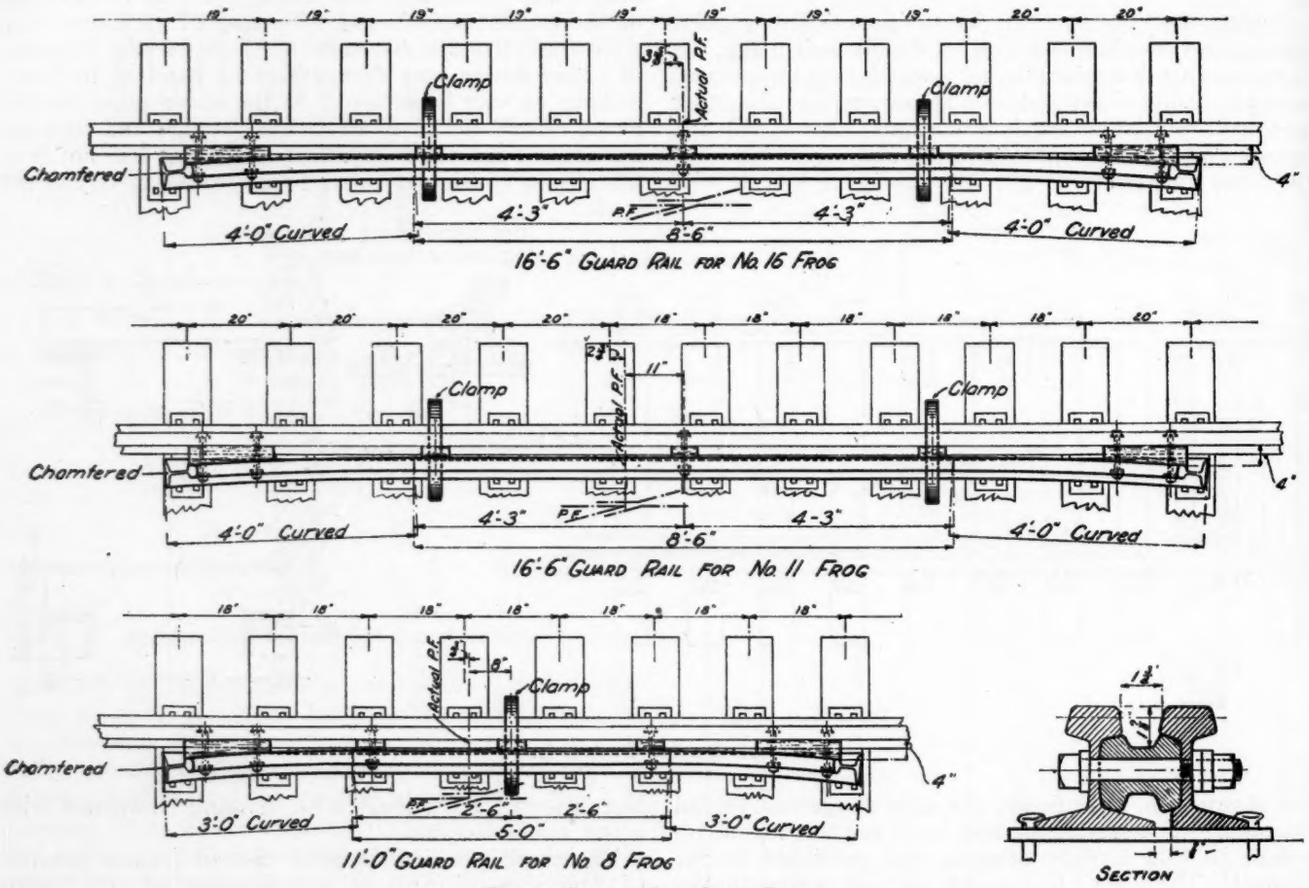
Late in June, G. W. Hegel, chief engineer of the Chicago Junction Railway, advised the president of the American Railway Engineering Association that he was contemplating making a careful test of the resistance of tie plates to brine drippings and offered to co-operate with this Association in making these tests. This subject was accordingly referred to the Track committee, and a sub-committee was organized to co-operate with Mr. Hegel, who afterward became a member of the Track committee and of this sub-committee.

The track on which the tests will be conducted is in the yards of the Chicago Junction Railway, Union Stock Yards, Chicago. This track is subjected to the almost continual movement of refrigerator cars and the resulting corrosion of track fastenings is especially severe. Preparations are now being made for the installation of tie plates of rolled steel, wrought-iron, malleable iron and American ingot iron. As the test is not primarily to determine the merits of the relative designs of tie plates, but rather of materials, only one design of each metal will be installed. With the exception of the American ingot iron plates, all tie plates are being purchased in the open market.

A certain proportion of each type of plate will be dipped in oil and will be oiled at regular intervals during the tests. Another portion will be dipped in hot tar before placing in the track, while the remainder will be inserted without preparation of any kind.

These plates are now being secured (October, 1915) and will be placed in the track within a short time. New rails will be laid and all ties with a life less than the expected duration of the test will be renewed in order that track conditions may be uniform. Representative plates of each kind of material will be retained for chemical and physical tests and other plates will be removed from the track from time to time during the progress of the test to determine the extent to which the plates are affected by this corrosive action.

The committee hopes to be able to present considerable information in its report next year.



Typical Plan of Frog Guard Rails.

Conclusions

The committee recommends the following:

Receiving as a progress report:

(1) The report on economics of track labor.

(2) The report on tests of tie plates subject to action of brine drippings.

For adoption:

The report on the relation between worn flanges and worn switch points.

For adoption and publication in the Manual:

(1) Design for a double switch lug.

(2) Typical layouts of Nos. 8, 11 and 16 double crossovers on 13- and 15-ft. centers. General plans.

(3) Typical layouts of frogs for Nos. 8, 11 and 16 double crossovers on 13- and 15-ft. centers.

(4) Typical layouts of Nos. 8, 11 and 16 double slip crossings with square switch points.

(5) Typical layouts of Nos. 8, 11 and 16 double slip crossings with staggered switch points.

(6) Typical plan of frog guard rails.

The committee recommends for next year's work:

(1) Continue the study of economics of track labor.

(2) Review the entire subject of frogs, switches, turnouts, crossings, etc., giving special attention to the use of tie plates, risers, etc., and recommend such changes in plans as may be needed to bring them up to the best practice.

(3) Continue the tests of tie plates under action of brine drippings.

(4) Consider recommendation of additional standards and specifications for manganese frogs and crossings.

(5) Report on the effect of the increase of 1/8-in. thickness of wheel flanges.

(6) Report on the reduction of taper of the tread of a wheel to 1 in 38 and on canting the rail inward, also concerning the reduction of the present limit of allowable flat spots on wheels, conferring with the Master Car Builders' Association.

Committee: J. B. Jenkins (B. & O.), chairman; G. J. Ray (D. L. & W.), vice-chairman; Geo. H. Bremner (I. C. C.), H. M. Church (B. & O.), Garrett Davis (C. R. I. & P.), W. R. Dawson (N. & W.), J. M. R. Fairbairn (C. P. R.), A. L. Grandy (P. N.), G. W. Hegel (C. S.), T. H. Hickey (M. C.), E. T. Howson (*Railway Age Gazette*), L. J. F. Hughes (C. R. I. & P.), E. L. Ingram (Univ. of Pa.), T. T. Irving (G. T.), J. R. Leighty (M. P.), H. A. Lloyd (Erie), A. C. Mackenzie (C. P. R.), P. C. Newbegin (B. & A.), F. B. Oren (I. C.), R. M. Pearce (P. & L. E.), F. W. Pfleging (N. P.), H. T. Porter (B. & L. E.), E. Raymond (A. T. & S. F.), W. G. Raymond (Univ. of Iowa), L. S. Rose (C. C. C. & St. L.), H. R. Safford (G. T.), C. H. Stein (C. R. R. of N. J.), A. H. Stone.

Discussion

J. B. Jenkins (chairman): Regarding the revision of the Manual, we thought it inadvisable, in view of the coming edition of the Manual, to make any additional changes this year, excepting those that are specifically recommended in the various sections of the reports. With reference to the second subject, economics of track labor, that has been very carefully covered and the committee is doing excellent work. We have laid out a program of work that will take at least 10 years to cover, and probably some time longer. It will be another year before we have our first definite results. We feel that the work of this sub-committee on economics of track labor is of great importance to the railroads in bringing about a more efficient and a more economical distribution of money for maintenance purposes. I move that the report on economics of track labor be received as a progress report.

The President: Without putting the motion, I assumed the convention will accept that report, as it is only a progress report.

Mr. Jenkins: I next refer to the report on tests of tie plates subject to action of brine drippings. I also ask that this be received as a progress report.

The President: The association will receive this as a progress report.

Mr. Jenkins: The committee has made a serious attempt to ascertain the relation between worn flanges and worn switch points. So far we have not been able to formulate any rule that will guide the track foreman in deciding when the proper time has arrived to take out a switch point. I would ask the adoption of this report.

The President: We will receive this report as information.

Mr. Jenkins: The sub-committee has presented a design for a double switch lock. We wish to amend the title to read, "Suggested double switch lug, to permit the switch to be thrown by either rod." We wish to offer this as information.

The President: This will be received as information.

Mr. Jenkins: We wish to present for adoption and publication in the Manual typical layouts for Nos. 8, 11 and 16 double crossovers for 13-ft. and 15-ft. track centers.

The President: The committee is now offering to you recommendations 2 and 3; 2 being typical layouts of frogs for Nos. 8, 11 and 16 double crossovers, 13-ft. and 15-ft. centers.

Mr. Sullivan: Does the committee mean by "typical layout" the position of the frog or the design of the frog?

Mr. Jenkins: The position. The drawings or typical layouts of the crossovers are merely diagrammatic.

The President: I think this is intended to get uniformity in regard to the location of the frogs.

Mr. Jenkins: The essential thing about the typical layouts for 13-ft. centers is the unsymmetrical arrangement. If you have two tracks between 12-ft. and 13-ft. centers, you could not have a symmetrical arrangement, and properly guard your frog points. With this unsymmetrical arrangement it gives opportunity to guard every point. If you have 11½-ft. centers you can use 7 and less than 5, making the other one special. If you have 13½-ft. centers you can use the six and over seven and in each case properly guard the points. If you have 12-ft. centers you use the two sixes. If you have 14 you would use the two sevens. After you get above 14-ft. centers this necessity for making them unsymmetrical no longer exists, but by using the unsymmetrical arrangement we can provide for 15-ft. and 16-ft. centers with only the addition of one more set of standards. In other words, with our two sets for 13-ft. and 15-ft. centers we have symmetrical arrangements for 12, 14 and 16 ft., with unsymmetrical arrangements for 13 and 15, and then by introducing a special arrangement on one side for any other distance between track centers that may be desired, using on one side of the double crossovers one of the standard arrangements.

(Recommendations 2 and 3 were adopted.)

Mr. Jenkins: Conclusion 4 is recommended for adoption and publication in the Manual, being typical layouts of Nos. 8, 11 and 16 double crossovers, 13-ft. and 15-ft. centers. We want to amend all three of these by adding notes (a), (b) and (c).

The President: Without objection the recommendation will be accepted by the association.

Mr. Jenkins: The next is conclusion 5, recommended for adoption and inclusion in the Manual, being typical layouts of Nos. 8, 11 and 16 double-slip crossings with staggered switch points. We wish to amend these plans by adding the notes (a), (b) and (c), and by striking out the words "heel blocks" in the same place as on the other drawings, and to

further amend it by increasing the distance between the movable points to 10 in., and changing the lengths of the movable points to 8 ft. 9 in. and 10 ft. 9 in., respectively.

The President: Without objection this recommendation will be approved by the association.

Mr. Jenkins: Conclusion No. 6 recommends for adoption and publication typical plans of frog guard rail.

J. A. Atwood (P. & L. E.): With reference to the 4 ft. at the end of the guard rail, I think that should be a straight line rather than a curved line. The object is to give an easier approach for the flange of the wheel coming to the narrow part of the guard and the straight line gives a better approach than the curved line.

Mr. Campbell: Is it the idea of the committee that the guard rail should be adjustable so as to take up the wear, or is that intended to be a fixed guard rail, its position being fixed and unchangeable by those filler blocks?

Mr. Jenkins: We have not made any provision for taking up the wear by closing in. It certainly would detract from the rigidity of the guard rail to attempt to do so.

Mr. Campbell: Personally, I believe the filler blocks should be so constructed that the guard rail can be adjusted. I think if that bolt in the center of the guard rail was replaced by a clamp it would be better still.

H. T. Porter (B. & L. E.): There is only one short filler block and you could use a two-piece filler block as adjustable, if so desired.

Mr. Jenkins: The committee is willing to add a note that an adjustable filler block may be used.

Mr. Lindsay: I wish to raise an objection to the two bolts through the filler block at the extremities of the 16-ft. 6-in. guard rail, as it weakens the main running rail at a point where the guard rail receives its first blow and great shock. It is not essential to hold that guard rail immovable at that point, and it can be held by a rail brace equally well without weakening the running rail.

(It was voted to accept the recommendation of the committee with the addition regarding the blocks.)

Mr. Jenkins: We wish to offer for adoption and publication definition of frog guard rail.

The definition offered by the committee was then adopted.

Mr. Jenkins: We offer for adoption and publication in the Manual the specifications for frog guard rail.

Mr. Sullivan: I object very much to limiting the foot guards to one particular kind of wood, which is pretty hard to get in some sections.

Mr. Jenkins: The committee is willing to revise that, making it read, "Sound hardwood."

The President: If there is no objection the specifications will be accepted and will be printed, considered adopted by the Association and included in the Manual.

(The committee was excused.)

Report of Committee on Buildings

The only item in the Manual that we recommend be changed is the item under "Engine Houses." The following should be added:

"When there is an engine house without a turntable and no 'Y' track or other means of turning provided, such engine house should preferably be equipped with smoke jacks at each end of each stall."

M. A. Long, Chairman

Freight House Scales

The weighing of package freight at freight houses is very important from a revenue standpoint, and the railroads are installing a greater number of scales, and giving serious consideration to the weighing of all package freight except possibly standard packages of known weight. There are some points where practically all the freight handled is of standard package freight, and at such houses very few scales are needed.

There are three classes of freight terminals, the largest being where both inbound and outbound houses are arranged in the same layout. At points where the inbound and outbound houses are in the same layout, it is desirable to have a scale at every second door opening in the outbound houses, or a maximum of 75 feet between scales, these to be located on the team side; while in inbound houses it is desirable to have scales placed 100 feet between centers as the maximum and located on the team side.

In layouts where one house handles both inbound and outbound freight and where the business is heavy and diversified, the scales should be located preferably at every third door opening, or a maximum of 75 ft. apart. Where this number of scales are used, they should be ample to take care of inbound weighing. Scales should be located on the team side of the house.

At small outlying stations, where there is a combination baggage and freight room, one dormant scale of approximately two tons capacity, located preferably at one side of the door nearest the team side, is recommended, as at this point it will be less liable to damage from trunks or large packages.

In large houses, scale platforms should be as small as practicable to accommodate the trucks used, and usually not over 6 ft. by 8 ft., except at certain localities, where one or two large scales are necessary to handle freight that is especially bulky.

Scales for houses handling freight only should have a minimum capacity of four tons. Higher capacity scales cost very little more and are economical from an operating and maintenance standpoint, as they will stand up better under the abuse they are usually subjected to. A dial scale, properly maintained, has a great many advantages over the beam type.

Ashpits

The ashpit is the most expensive structure on a railroad, from a maintenance standpoint. Therefore, a great deal of thought should be given to the design. The usual procedure at an ashpit is to drop the hot ashes into the pit and this heats up the walls and other parts of the

structure. Then cold water is thrown on the ashes to cool them. This rapid cooling causes contraction in the material of which the structure is built, and when repeated many times, weakens and sometimes destroys the structure. Another destructive element is the sulphuric acid produced by the water and sulphur in the ashes. This destroys the steel parts (coming in contact with it) at a rapid rate. Most ashpits are built of concrete, in which limestone is a principal ingredient. Hot ashes cause this limestone to swell and disintegrate, and in a short time the concrete begins to spall off. Firebrick facing has been used, but on account of the nature of the work and the tools used, experience shows that they are soon knocked off. Slag has been used in place of stone, and makes a good substitute. Gravel also makes a good substitute, and if trap rock is available, it is better than either of the above materials.

(1) At outlying districts, where few engines are handled, cast-iron ties, approximately 12 in. high, are used to prevent burning wood ties. These should be located on spur tracks.

(2) A pit located between the track rails, approximately 3 ft. deep and of a length is constructed to suit the business handled. The cinders are shoveled out on the track level and loaded by hand into cars or loaded into barrows and wasted at a convenient place. In some instances these pits are fitted with buckets, which are handled by pillar crane, and sometimes by traveling or gantry crane, and loaded into cars.

(3) A pit similar to Type 2, with one side open, the pit being 3 ft. deep, with a depressed track alongside, and the top of car approximately level with the base of rail on the cinder track.

(4) A depressed pit filled with water, into which the cinders are dropped, one feature being to design the pit so that cinders will drop directly into the water and reach the main body of the pit freely, another feature being the easy removal of the cinders by a grab bucket operated either by a gantry or a locomotive crane.

(5) A pit equipped with bucket or car located under the track and hoisted by mechanical means, the cinder bucket or car running on rails placed on an incline, and the car being run high enough to dump in a car located on a track parallel to and approximately 25 ft. centers from ash track.

All types of pits should be equipped with a water supply to wet down the hot cinders.

The available records are not kept in such shape that it is possible to determine the relative economy of various types of pits, but where a large number of engines are handled, the water pit, with locomotive or gantry crane with grab bucket, is recommended.

The committee has no additional information to offer on coaling stations, the report last year being as complete as we could make it, except for the question of storing coal in summer for winter consumption to relieve revenue cars during the winter season. The committee recommends this subject be continued for another year, and that it be instructed to consider the storing and handling of stored coal.

Committee: M. A. Long (B. & O.), chairman; G. H. Gilbert (Q. & C.), vice-chairman; G. W. Andrews (B. & O.), J. P. Canty (B. & M.), D. R. Collin, W. H. Cookman (P. R. R.), C. G. Delo (C. G. W.), W. T. Dorrance, C. H. Fake (M. R. & B. T.), A. T. Hawk (C. R. I. & P.), E. A. Harrison (A. T. & S. F.), P. B. Roberts (G. T.), W. S. Thompson (P. R. R.).

Discussion

M. A. Long (chairman): The first subject is the revision of the Manual. There is an addition to the engine houses; the following should be added: "When there is an engine house without turntable and no wye-track or other means of turning provided, such engine house should preferably be equipped with smoke jacks at each end of each stall."

The President: Not hearing any objection, this will be accepted to be included in the Manual.

Mr. Long: The second subject is the question of freight house scales. We offer this report for publication in the Manual as a whole.

Mr. Ray: I move that this be received as information or go back to the committee for further consideration.

The President: If there is no objection this will be referred back to the committee. The chairman informs me that he proposes to do the same thing with the recommendations in regard to various types of pits, and it seems to me that should take the same course. If there is no objection this will be referred back to the committee and they can resubmit the conclusions.

(The committee was excused with the thanks of the association.)

Report of Committee on Electricity

The following outline of work was assigned by the Board of Direction:

(1) Make a critical examination of the subject matter in the Manual, and submit definite recommendations for changes.

(2) Continue the study of the subject of clearances of third rail and overhead structures, conferring with other committees.

(3) Continue the study of electrolysis and insulation and the effect upon reinforced concrete structures.

(4) Report on water power for electrical railway operation.

(5) Continue the study of maintenance organization and relation to track structures.

G. W. Kittredge, Chairman

The sub-committee on Clearances has brought up to date as of December 31, 1915, data regarding overhead clearances on various electrified roads in the United States and also data regarding third-rail clearance on various electrified roads.

R. D. Coombs, G. A. Harwood and E. B. Katte have continued serving as representatives of this Association on the national joint committee on Overhead and Underground Line Construction. This joint committee has not yet completed its work on the revision of the crossing specifications, nor completed any other new specification.

The Association's delegates were actively engaged with the joint committee on the preparation of the revised specifications for crossings, when the progress

of the national joint committee's work was arrested and held in abeyance by the fact that the United States Bureau of Standards was about to issue a safety code which included specifications for crossings. Therefore no definite report will be made by the national joint committee until the safety code is issued and subjected to study by the national joint committee. It is hoped that the national joint committee will take up its interrupted work early in 1916.

(1) The committee recommends that the revised data regarding overhead and third-rail clearances be received as information.

(2) The committee recommends that representatives continue to serve on the national joint committee on Electrolysis and the national joint committee on Overhead and Underground Line Construction, and that the statistical data furnished by the sub-committee on Clearances be kept up to date.

(3) The committee also recommends that during the coming year the subject of a report on water power for electrical railway operation be taken up and a report considered and submitted.

(4) That consideration be given any new information that may develop in reference to maintenance, organization and relation to track structures, and asks for such other instructions as seem necessary or desirable.

Committee: George W. Kittredge (N. Y. C.), chairman; J. B. Austin, Jr. (L. I.), vice-chairman; D. J. Brumley (I. C.), R. D. Coombs (Cons. Engr.), A. O. Cunningham (Wabash), Walt Dennis (C. R. I. & P.), R. H. Ford (C. R. I. & P.), George Gibbs (Cons. Engr.), G. A. Harwood (N. Y. C.), E. B. Katte (N. Y. C.), C. E. Lindsay (N. Y. C.), W. L. Morse (Jacksonville Terminal), W. S. Murray (N. Y. N. H. & H.), J. A. Peabody (C. & N. A.), Frank Rhea (I. C. C.), J. R. Savage (L. I.), Martin Schreiber, H. U. Wallace.

Discussion

C. E. Lindsay (chairman): The committee has nothing but a progress report, yet it has made progress. On the subject of clearances it has brought up to date the data regarding overhead clearances on various electrified roads of the United States.

(The committee was excused with thanks.)

Report on Grading of Lumber

Last year the committee called attention to the practical difficulties of distinguishing between various species of Southern yellow pine, and to the fact that it has been generally recognized that it makes little practical difference from what species of pine a structural timber is cut so long as certain density requirements are met, in addition to the usual heart and sap requirements.

Hermann Von Schrenk, Chairman

During the past year, after a very exhaustive series of investigations conducted by the United States Forest Service, in co-operation with the manufacturers of Southern yellow pine, the American Society for Testing Materials adopted a rule establishing two classes of Southern yellow pine, called "dense" pine and "sound" pine. This rule is practically that formulated by the United States Government and used in the purchase of timber for the Panama Canal. Since the adoption of the rule by the American Society for Testing Materials, it has been endorsed and accepted as a whole by the Southern Pine Association, which includes the largest manufacturers of Southern yellow pine. The committee has followed the investigations made by the Government and by the American Society for Testing Materials, and has co-operated with the committees which considered these matters, and is strongly of the opinion that the rule adopted offers a very practical solution of an exceedingly vexing problem. The detailed investigations made by the Government, upon which the new rule was based, are fully set forth in the 1915 report of the committee of the American Society for Testing Materials.

After a careful consideration of the matter, the committee has approved the new rule, and presents it to the members of this Association, with the recommendation that it be adopted as standard.

Attention is called to the fact that two classes of Southern yellow pine are established—dense pine and sound pine. These terms replace the botanical designations hitherto used, namely, longleaf and shortleaf pines. The terms dense and sound pines refer strictly to qualities of density and weight in their relation to strength values.

The adoption of the new grading rules by this Association would not change any of the standard rules for structural timbers, except that in the specifications as now printed in the Manual, the term "longleaf" would be changed to read "dense pine," and the term "shortleaf" to read "sound pine." The classification "dense pine" will include all of the high-grade pieces of what has hitherto been called "longleaf" and exclude the pieces of longleaf pine of inferior strength. It would also include a comparatively small percentage of the strongest pieces of shortleaf pine. At the present time, the standard specifications for structural timbers as printed in the Manual designate that certain timbers shall be longleaf and that others may be shortleaf. There has been no method, however, which could be used to determine whether any particular timber was longleaf or shortleaf. The new rule ignores the difficult problem of determining the botanical species and substitutes therefor a basis of physical measurement which can be readily applied and which will not be subject to personal opinion or individual judgment.

Definition for Southern Yellow Pine*

Southern Yellow Pine.—This term includes the species of yellow pine growing in the Southern States from Virginia to Texas, that is, the pines hitherto known as longleaf pine (*Pinus palustris*), shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), Cuban pine (*Pinus heterophylla*) and pond pine (*Pinus serotina*). Under this heading two classes of timber are designated: (a) dense Southern yellow pine, and (b) sound Southern yellow pine. It is understood that these two terms are descriptive of quality rather than of botanical species.

(a) Dense Southern yellow pine shall show on either

*Adopted and copyrighted by the American Society for Testing Materials, August, 1915.

end an average of at least six annual rings per inch and at least one-third summer-wood, or else the greater number of the rings shall show at least one-third summer-wood, all as measured over the third, fourth and fifth inches of a radial line from the pith. Wide-ringed material excluded by this rule will be acceptable, provided that the amount of summer-wood as measured shall be at least one-half. The contrast in color between summer-wood and spring-wood shall be sharp and the summer-wood shall be dark in color, except in pieces having considerably above the minimum requirement for summer-wood.

In cases where timbers do not contain the pith, and it is impossible to locate it with any degree of accuracy, the same inspection shall be made over three inches on an approximate radial line beginning at the edge nearest the pith in timbers over three inches in thickness and on the second inch (on the piece) nearest to the pith in timbers three inches or less in thickness.

In dimension material containing the pith, but not a 5-in. radial line, which is less than 2 in. by 8 in. in width, that does not show over 16 sq. in. on the cross-section, the inspection shall apply to the second inch from the pith. In larger material that does not show a 5-in. radial line the inspection shall apply to the 3 in. farthest from the pith.

The radial line chosen shall be representative. In case of disagreement between purchaser and seller, the average summer-wood and number of rings shall be the average of the two radial lines chosen.

(b) Sound Southern yellow pine shall include pieces of Southern pine without any ring or summer-wood requirement.

Grading Rules for Hemlock Lumber

In last year's report (*Railway Age Gazette*, March 19, 1915, page 666) we presented tentative grading rules for hemlock lumber. These have been discussed during the past year, and certain changes are herewith suggested.

It is recommended that under the heading, "General Instructions," paragraphs 3, 4 and 6 should be omitted, and that paragraphs 4, 5, 7, 8 and 9 should be renumbered respectively 3, 4, 5, 6 and 7. With these three omissions, the committee recommends the adoption of the grading rules for hemlock lumber this year as standard practice.

Specifications for Bridge Timbers to be Creosoted

The committee has been at work, in co-operation with the American Society for Testing Materials, with a view of preparing specifications for bridge timbers to be creosoted. The committee of the American Society for Testing Materials made a tentative recommendation last year, which the committee is unable to endorse. It is believed that specifications for timbers to be creosoted, as far as their quality and strength are concerned, should be similar to timbers to be used untreated, with the exception of the relation of heart- and sapwood. Where timbers are to be creosoted, a certain amount of sapwood is desirable; in fact, the recent investigations made on some of the German Government railways seem to indicate that the ideal condition is obtained when a complete ring of sapwood surrounds the heartwood. Keeping these factors in mind, the committee has prepared the following specifications, which are presented as information.

In formulating these new specifications the committee has simply taken the standard specifications for structural timber as printed in the Manual, and omitted all reference to the requirements as to heartwood and heart face, and has substituted for the heart requirements a clause permitting sapwood. The most recent investigations have plainly shown that sapwood and heartwood have exactly the same strength, with equal moisture content. The suggested specifications therefore practically represent the standard as printed in the Manual, with the exception that it now gives a specification which will give the best results when chemically treated.

Proposed Specifications for Southern Yellow Pine Bridge and Trestle Timbers to be Treated

(To be applied to single sticks and not to composite members)

1. *General Requirements.* — Except as noted, all timber shall be sound, sawed to standard size, full length, square cornered and straight; close grained and free from defects such as injurious ring shakes and cross grain, unsound or loose knots, knots in groups, decay, or other defects that will materially impair its strength.

2. *Standard Size.*—"Rough timbers sawed to standard size" means that they shall not be over ¼-in. scant from the actual size specified. For instance, a 12 by 12-in. timber shall measure not less than 11¾ in. by 11¾ in.

3. *Standard Dressing.*—"Standard dressing" means that not more than ¼ inch shall be allowed for dressing each surface. For instance, a 12 by 12-inch timber after being dressed on four sides shall measure not less than 11½ by 11½ inches.

4. *Quality.*—All timbers shall be dense pine as defiined by the American Society for Testing Materials' rules for dense pine.*

5. *Stringers.*—Knots greater than 1⅛-in. in diameter will not be permitted in any section within 4 in. of the edge of the piece, but knots shall in no case exceed 4 in. in their largest diameter. There shall be no restrictions as to the amount of sapwood allowed.

6. *Caps and Sills.*—Shall be free from knots over 2½ in. in diameter. There shall be no restrictions as to the amount of sapwood allowed.

7. *Posts.*—Shall be free from knots over 2½ in. in diameter. There shall be no restrictions as to the amount of sapwood allowed.

8. *Longitudinal Struts and Girts.*—Shall be square cornered and sound and shall be free from large knots or other defects that will materially injure their strength. There shall be no restrictions as to the amount of sapwood allowed.

9. *Longitudinal X Braces, Sash and Sway Braces.*—Shall be square cornered and sound and shall be free from any large knots or other defects that will materially injure their strength. There shall be no restrictions as to the amount of sapwood allowed.

10. *Ties and Guard Rails.*—Shall be free from any large knots or other defects that will materially injure their strength. There shall be no restrictions as to the amount of sapwood allowed.

Summary

We recommend:

1. That the definition for quality of Southern yellow pine be adopted as standard.

2. That the grading rules for hemlock lumber be adopted as standard, with the omissions as indicated in this report.

The committee suggests as subjects for investigation during the coming year:

1. Further investigation with reference to specifications for Douglar fir timbers, to be carried on in co-operation with the American Society for Testing Materials and other organizations.

2. Investigation and report with reference to the lasting power of pines and other coniferous woods, as influ-

*In case the definition for "dense pine" is adopted by this Association, the reference to "definition" should be changed.

enced by the resin content of timber, this work to be done in co-operation with the American Society for Testing Materials and other engineering bodies and the Federal Government Bureau now engaged in extensive investigations dealing with this subject.

3. The revision of specifications for rules already issued. Several organizations or manufacturers have materially simplified their rules or are in the process of doing so. The committee believes that some of the rules already adopted are too cumbersome, and that with further work very material shortening may be obtained which will result in a wider application to maintenance of way work.

Committee: Dr. Hermann von Schrenk (Cons. Timber Engr.), chairman; B. A. Wood (M. & O.), vice-chairman; W. McC. Bond (B. & O.), D. Fairchild (N. P.), W. H. Norris (M. & C.), J. J. Taylor (K. C. S.).

Discussion

H. von Schrenk (chairman): We have two recommendations to make. The first is that we recommend for adoption a new definition for quality of Southern yellow pine timbers. We have all been specifying long-leaf pine a great many years, and have had to let the matter drop because none of us have been able to identify material after received from manufacturers. Under the lead of the United States government, the technical committees of the American Society for Testing Materials for the last five years have been going into this matter, and they presented a concrete and comprehensive report at the annual convention last year. Under instructions from the Board of Direction of this association, your committee, a number of whom were members of this other organization, considered this matter during the last year and came to the conclusion that it was a desirable thing to recommend these revised rules for adoption. There is practically nothing that we have heard that can be said against such procedure, except possibly the question involved in the lasting power of the different species of wood which will be included under the first grade. We are of the opinion that the chances we are taking in including the strength pieces of short-leaf and loblolly pine will be far less than the chances we will take in being able to identify the higher grade species in the Manual at the present time. In the new classification the strength characteristic is one which will assure our getting pieces like the classes represented in the upper photograph, having the higher modulus of rupture. I would accordingly move that the definitions as printed be adopted as standard by this association.

The President: If there is no objection the definition will be considered adopted and it will be printed in the Manual.

Dr. von Schrenk: The second recommendation is with regard to grading rules for hemlock lumber. These rules were printed as information last year. We have revised the rules and have made certain omissions, largely of a typographical nature, which we do not believe have any place in a general specification. The recommendation which we now make to you is, that having received various suggestions we now move that the grading rules as printed, with the omission of paragraphs 3, 4 and 6, be adopted as standard.

The President: It will be considered that the association approves this course.

(The committee was excused with thanks.)

Report on Economics of Railway Location

The committee on Economics of Railway Location is not in shape to submit any conclusions or recommendations this year, and therefore reports progress.

The chairman of the committee made a careful study of the statistics of coal consumption in freight service on the Western Lines of the Canadian Pacific for the past eight years. These studies have convinced him that instead of attempting to base coal consumption directly on the amount of work done, it is better to divide the coal into two factors, one varying directly with the amount of work done and the other varying with the engine miles run. As a result of these studies, the following formulæ have been adopted for the Western Lines on the Canadian Pacific:

J. G. Sullivan, Chairman

Single-Track Operation.—Fairly busy lines, 3.5 lb. of coal per calculated horsepower hour, plus 70 lb. of coal per engine mile run.

Double-Track Operation.—3 lb. of coal per calculated horsepower hour, plus 60 lb. of coal per engine miles run.

The above figures are an average for the year, for conditions on the Canadian Pacific Western Lines, using engines equipped with superheaters and having drawbar pull varying from 36,000 to 42,000 lb. each. The calculated horsepower is the work done overcoming resistance, lifting loads from a lower to a higher elevation and overcoming curve resistance. Acceleration and work done running air pumps, being indeterminate, were not taken into account in the calculated horsepower hours. The amount of coal per engine miles run covered the above work besides coal used in keeping steam up in locomotives, burned at sidetrack or wasted at roundhouses.

Committee: John G. Sullivan, chairman (C. P. R.); C. P. Howard, vice-chairman (I. C. C.); F. H. Alfred (P. M.), Willard Beahan (N. Y. C.), R. N. Begien (B. & O. S. W.), Maurice Colburn (Van.), D. F. Crawford (P. L. W.), A. C. Dennis (Contr. Engr.), R. D. Garner (S. N. E.), A. S. Going (G. T.), F. W. Green (L. & A.), P. M. LaBach (C. R. I. & P.), Fred Lavis (Cons. Engr.), J. deN. Macomb, Jr. (A. T. & S. F.), S. S. Roberts (Cons. Engr.), E. C. Schmidt (Univ. of Ill.), A. K. Shurtleff, L. L. Tallyn (D. L. & W.), Walter Loring Webb, H. C. Williams (L. & N.), M. A. Zook (I. C. C.).

Discussion

J. G. Sullivan (chairman): At a meeting held yesterday it was decided to ask the association to re-assign the subjects that were assigned last year.

(The committee was excused.)

Report on Records and Accounts

The Board of Direction assigned the following subjects to this committee:

(1) Make a critical examination of the subject-matter in the Manual, and submit definite recommendations for changes.

(2) Report on the use of small forms on cardboard or other suitable material for use of fieldmen in making daily reports, to the end that supervision may be facilitated and efficiency encouraged.

(3) Continue the study of feasible and useful subdivisions of Interstate Commerce Commission Classification Accounts Nos. 202 and 220, with a view of securing uniformity of labor costs, separating the items in accordance with such forms as are promulgated by the Interstate Commerce Commission during the year.

W. A. Christian, Chairman

(4) Investigation of methods for reproducing maps and profiles on drawing linen for permanent record.

After careful study the committee has no further changes to suggest in the Manual other than the recommendations submitted in its report of 1915.

However, the committee submits below a list of symbols which it considers preferable to those now in the Manual, and desires an expression from the Association whether these symbols should be substituted for those adopted last year:

Railroad tracks—old track to remain ..... Use heavy black line.

Foreign tracks ..... Use fine black line.

Company property line to be "Company Property Boundary Line"..... External / Internal

Track pan ..... (Track Pan.)

Use symbol of trestle..... Denote kind and span.

True magnetic meridian..... N — Variation Angle

Pipes ..... (Ownership, size and kind.)

The use of small forms on cardboard:

The committee reports progress on the use of small forms on cardboard, and hopes to be able to make a report thereon next year.

Since the Interstate Commerce Commission has not promulgated any new forms having a bearing on Accounts Nos. 202 and 220, the committee makes no further recommendations other than submitted in 1915.

The best known reproductions of tracings are as follows:

Ferro Prussiate—White line on blue ground.
Pellet—Blue lines on white ground.
Ferro-gallic—Black lines on white ground.
Brown—White lines on brown ground.
The photographic process.
The hectograph process.
The planograph process.
The lithographic process.

The first four are too well known to need any explanation. The photographic process is quite varied, but the one most generally used is where the photograph is made positive on paper without the use of the so-called negative. The hectographic process is one where the various colors of inks are used, and when applied to pads the inks are absorbed therein. The planograph process is one where the image is reproduced negatively on a coated plate and treated with chemical baths, allowing the high and low lights to stand in relief. This plate may be used in a printing press. The lithographic process is the latest in this country, and on account of its cheapness it is used for the reproduction of original tracings. As it is a dry process throughout, the reproductions are naturally true to scale of the original.

In explaining this latter process, it might be said that a plate of any smooth substance, such as metal, glass or linoleum, is coated with a gelatine in which are placed certain chemicals after the gelatine is melted. To apply this gelatine the plate is placed in an inclined position and covered with the gelatine. After the plate is entirely covered, it is put in a horizontal position and allowed to cool. The original tracing is put in a vacuum frame and a print is made similar to a blueprint. This print then is applied to the gelatine plate, and removed as fast as applied. The image of the original appears on the gelatine in dark blue lines caused by the action of the chemical of the print and gelatine. Ink is then applied to the gelatine and adheres in proportion to the density of the lines of the original. This is the most important thing in this process. In other words, the reproductions are only good if the lines of the original are opaque. This process should be worked in a cool temperature. Reproductions by this process may be made on any material. Any portion of the original not wanted in the reproduction can be removed either on the so-called blueprint or plate. Any additions may be made in sections by making another print of same and pasting it on the original blueprint before applying to the pad.

Where originals, as in railroad alinement maps, are very long and wide, it is possible to reproduce these in any desired width or length. It is quite common on right-of-way sheets to reproduce the land schedules in their proper places, originals having been made on a typewriter using a black ribbon and having a black carbon reversed on the back of the original, thereby making letters opaque.

The committee recommends that this report be accepted as information.

Recommendtions for Next Year's Work

(1) Prepare standard specifications for maps and profiles.

(2) Study various methods of reproducing maps and profiles on tracing linen for permanent records.

(3) Study the Interstate Commerce Commission classifications of "Investment in Road and Equipment" and "Operating Expenses," and report upon any desired changes.

(4) Make a comprehensive study of the problem of recording and reporting the cost of additions and betterments.

(5) Make a comprehensive study of the valuation forms now in use in America and recommend standard forms for both field and office use.

Committee: W. A. Christian (I. C. C.), chairman; M. C. Byers (W. M.), vice-chairman; F. J. Bachelder (Cons. Engr.), Lester Bernstein (B. & O.), W. S. Danes (Wabash), G. D. Hill (I. C.), Henry Lehn (N. Y. C.), J. H. Milburn (B. & O.), J. W. Orrock (C. P. R.), J. C. Patterson (Erie), H. C. Phillips (Pres. Conf. Comm.), J. H. Prior (Ill. State Pub. Util. Comm.), J. H. Reinholdt (M. & St. L.), R. C. Sattley (C. R. I. & P.), Guy Scott (P. L. W.), Huntington Smith (N. Y. C. & St. L.), H. M. Stout (N. P.), Frank Taylor (C. P. R.), J. M. Weir (C. R. I. & P.), W. D. Wiggins (P. L. W.).

Discussion

W. A. Christian (chairman): Under the heading of subject-matter for the Manual, we make no recommendations other than those made last year. As to the conventional signs, we hesitate to recommend any changes, but we do show a few changes which have been brought up and perhaps should be submitted to the convention. The committee offers this matter for information.

(The committee was excused with the thanks of the Association.)

Report on Wood Preservation

Of the subjects assigned to the committee for study, report is submitted on the following:

(1) Water sampling in creosote oil.

(2) The relation of the amount of preservative and the depth of penetration to the resistance of materials against decay.

(3) The compilation of service test records.

During the past year the committee has given further attention to the question of developing a standard method for determining the percentage of water contained in creosote oil when shipped in tank cars.

Earl Stimson, Chairman

The sampling of liquids in tank cars is an exceedingly difficult matter; in fact, a special committee of the American Society for Testing Materials reported that it had been unable to find any method which could be recommended for obtaining satisfactory samples of liquids when shipped in tank cars. After much consideration, the committee finally decided to carry on a series of tests with various methods for sampling. These tests were carried on under the auspices of the committee with the co-operation of similar committees, at the request of the chairman, of the American Society for Testing Materials and the American Wood Preservers' Association.

Under the direct supervision of the Sampling committee, two tank cars were loaded with creosote oil at the Shadyside, N. J., plant of the Barrett Manufacturing Company, December 22, 1915, shipped to the Federal Creosoting Company plant at Rome, N. Y., and unloaded at that point on January 3, 1916. Samples were taken by various means and afterward divided into three sets. One set of samples was tested in the laboratory of Von Schrenk and Kammerer, another in the laboratory of the Port Reading Creosoting Plant, and the third in the laboratory of the Barrett Manufacturing Company.

In accordance with the prearranged plan, one car was loaded with substantially dry oil, and a measured volume of water added to the car from a separate source, and the other car was loaded with oil containing about 7 per cent. of water. Before loading, the cars were cleaned and the steam coils tested.

The results obtained by the various methods of sampling from the car which contained dry oil to which water was deliberately added, varied widely, but on the other hand, the tests on wet oil contained in one of the other cars containing wet oil are quite uniform. The committee observed that the water separated rapidly from the oil in the first car, so that indeed there was more free water on the surface of the oil within two hours after loading than there was at the time of unloading. Evidently the water and oil had become mixed during transit and the water did not again separate so rapidly from the oil. With the other car, on the other hand, there was no apparent separation of water and oil, even though this oil contained more water than the other. It is obvious, of course, that the partial separation of oil and water, such as took place in the first car, makes sampling more difficult than when the water is uniformly distributed throughout the oil.

The tests described above and the results obtained are presented as a progress report. The following preliminary conclusions have been drawn by the committee.

1. That for accurate determination of the water in a tank car of creosote, a system of sampling from several zones in a car is necessary. These zones must represent definitely calculated areas throughout the entire depth of the car. There must be at least three zones, the top, the middle and the bottom of the car. The indications are that for the most definite determinations zones one foot deep are to be preferred.

2. That for calculating any percentage of water found in any zone in relation to the proportion to the entire car, the correction factor indicated on diagram 3 be used (diagram not shown).

3. That the cross-section tube frequently used for taking samples from tank cars is of little value. It disregards the fundamental principle of zone sampling, in that it takes no account of the proportionate value of the sample taken with reference to the whole car. It, furthermore, cannot be used in connection with zone sampling without much additional computation.

4. The so-called thief has been found incorrect in theory, and the results obtained therewith confirm this.

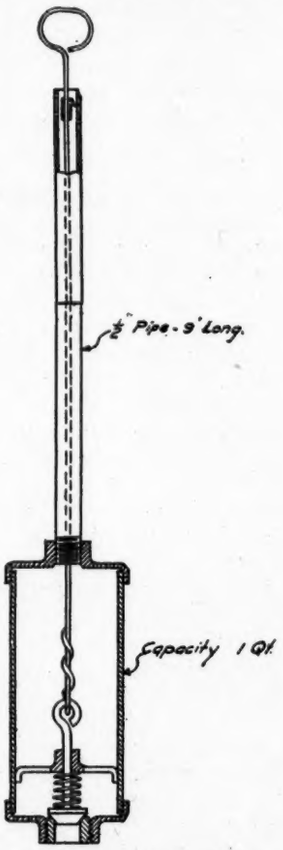
5. That the taking of a dipper or bucket sample from the running stream of cars while discharging does not give reliable results, and that this method should not be used.

6. That the bottle method, meaning the use of a small stoppered vessel from which the cork can be withdrawn at any desired level, is a convenient apparatus for taking zone samples. Its disadvantage lies in the fact that escaping air, after the withdrawal of the cork, tends to disturb the surrounding oil, and therefore gives an incorrect sample.

7. That for the present an apparatus, the principle of which is shown in Fig. 1, be used for zone sampling in taking samples from cars in which a high percentage of water is suspected. It should be understood that the appended sketch is merely to show the general plan of the sampler.

8. That efforts be made to construct an improved form of the sampler just referred to, provided further tests warrant a definite recommendation for its use.

9. That for ordinary purposes the taking of three zone samples, that is, from the top, the middle and the bottom of a car, by means of the apparatus just referred to or by means of a bottle device, is recommended.



The Sampling Apparatus Recommended

10. That the tests described this year be considered preliminary and that similar tests be made at various treating plants and tar plants during the coming year. Care should be taken to make such tests to include both summer and winter shipments.

The Relation of Amount of Preservative and Depth of Penetration to Resistance Against Decay

This subject is new as regards its investigation by this committee, and, in fact, as far as known, has not been systematically investigated by any organization. The value and importance of an established relation between the amount and depth of preservatives to the resistance of the timber against decay is readily apparent, and it is equally obvious that this determination must be based on the results of service tests. In examining the data available it was found immediately that service records include only one of the factors, namely, the amount of preservative, and that the depth of penetration is not recorded. There is a further difficulty; that of the widely recognized variation in penetrability, even of woods of the same species. In other words, ties or timbers treated with a given amount of oil will show wide variations in the depth of penetration, due to the percentage of sapwood, the moisture contents of the stick, and other variables which are less readily explained. It is assumed that all good treatments completely penetrate the sapwood, the heartwood absorption usually being superficial.

The factor of mechanical abrasion is most important in determining the depth of penetration necessary to give protection against decay. The records of timbers and piling that were not exposed to mechanical wear and in which the impregnated wood extends from one-half to two inches on the outside, indicate that complete penetration is not necessary if the outer protective ring remains unbroken, and the ends are likewise protected. On the other hand, we have a very definite record of creosoted ties placed in the tracks of the Norfolk Southern in 1896, which resisted decay until abrasion under the rail cut through the treated portion. As soon as this happened decay commenced at the unprotected point, and necessitated the removal of many ties which otherwise were in good condition. This simply indicates that penetration of creosote should be of sufficient depth to always give protection to the untreated center, and that as soon as this protective area is broken decay begins.

A record of service tests was presented in an appendix. It consisted of the usual tabulated statement of the results of the latest inspection of the test sections of track maintained by the various railroads, and in addition a detailed description of several of the test tracks upon which records of the service have been kept for eight years or more.

The committee recommends that it

(1) Continue the study of water sampling in creosote oil.

(2) Continue the study of the relation of the amount of preservative and the depth of penetration to the resistance of the material against decay.

(3) Derive conclusions from the results of exposure tests of material treated with water gas tar.

(4) Report on the economics of treated timber.

(5) Compile service test records, extending them to include structural timbers.

Committee: Earl Stimson (B. & O.), chairman; E. H. Bowser (I. C.), vice-chairman; F. J. Angier (B. & O.), W. A. Fisher (A. C. L.), C. F. Ford (C. R. I. & P.), Dr. W. K. Hatt (Purdue Univ.), V. K. Hendricks (St. L. & S. F.), George E. Rex (A. T. & S. F.), E. A. Sterling, Lowry Smith (N. P.), C. M. Taylor (P. & R.), C. H. Teesdale (U. S. Forest Service), T. G. Townsend (Southern), Dr. Hermann von Schrenk (Cons. Engr.).

Discussion

Earl Stimson (chairman): The committee submits reports on three of the subjects, the first being water sampling in creosote oil. Dr. von Schrenk will present that portion of the report.

Dr. von Schrenk: One of the great difficulties that has been found in the creosote industry has been the lack of definite methods of sampling tank cars. We have offered a table or graphic method of arriving at a test of a tank car, and give the results of a number of samples. It is the hope of the committee that by next year these experiments will have been conducted along an extended line of activity.

Mr. Stimson: The second subject assigned is on the relation of the amount of preservative and the depth of penetration to the resistance of materials against decay. We have made a progress report on this subject. The third subject is the compilation of service test records. That is presented in Appendix A of this report. We offer that as a progress report also.

(The committee was relieved with thanks.)

Report of Committee on Rail

The subjects assigned for investigation and report are as follows:

1. Make a critical examination of the subject matter in the Manual, and submit definite recommendations for changes.
2. Report on rail failures, statistics and conclusions.
3. Report on the effect on rail of defective equipment and improper maintenance.
4. Continue special investigations of rails.
5. Track bolts and nutlocks.

J. A. Atwood, Chairman

The committee has no changes to suggest in the chapter on Rail, as shown in the 1915 Manual, at the present time. By reference to the recommendations, it will be noted that certain specifications now embodied in the Manual under the chapter on Track are to be withdrawn and those submitted in this report substituted, if approved by the Association.

The statistics covering rail failures for the period ending October 31, 1914, were issued in Bulletin 179. They show a decrease in the number of failures of rails rolled in successive years since 1908, as indicated by the figures showing the failures of open-hearth rails rolled by all the mills, expressed as number of failures per 10,000 tons of rail laid.

Year Rolled	——Years of Service of Rails—— 0 Year	1 Year	2 Years	3 Years	4 Years	5 Years
1908	....	....	....	....	.....	268.9
1909	....	....	....	....	109.0	141.7
1910	....	....	....	57.6	76.3	.....
1911	....	....	37.4	58.8	.....	.....
1912	....	18.4	20.1	....	.....	.....
1913	1.2	7.9	....	....	.....	.....
1914	0.8	....	....	....	.....	.....

The final basis of comparison is the number of failures per 10,000 tons for five years' service, but when this age has not been reached for the later rollings, a comparison can be made in the meantime on a less number of years' service, and a study of this table indicates an improvement for the successive years' rollings as compared with the rollings of previous years.

The statistics for the year 1915 are in process of compilation. The basis of comparison has also been changed from "failures per 10,000 tons of rail laid" to "failures per 100 track miles of rail laid," and the next report will be on this basis.

The subject, The Effect on Rails of Defective Equipment and Improper Maintenance, was assigned with the object of determining the effect of bad spots in wheels on rails with a view to having the allowable defects in wheels changed if found to be necessary, and experiments in that line are being considered. This is rather a complex subject and we are unable to make any definite report until such time as the joint committee on Stresses in Railroad Track is prepared to go extensively into the matter of making experiments to develop just what the effect of bad flat spots on wheels is on the rail.

During the year special reports have been presented to the Rail committee as follows:

Segregation and Sponginess in Ladle Test Ingots. By Robert W. Hunt & Co.

Influence on Rails of Method of Blooming. By M. H. Wickhorst.

American Rail Mill Practice. By the sub-committee on Mill Practice.

Internal Fissures in Rails. By a sub-committee.

Some Causes of Rail Failures. By W. C. Cushing.

The Nick and Break Test in the Inspection of Steel Rails. By Robert W. Hunt and C. W. Gennet, Jr.

The paper on ladle test ingots calls attention to the importance of obtaining the test ingots free from sponginess, if it is to correctly represent the composition of the steel in the heat. A spongy test ingot is apt to be of very heterogeneous composition, and aluminum is suggested as a desirable addition to the test ingot to prevent sponginess in it.

The paper on methods of blooming is a contribution to the study by the experimental method, of the influence of various methods of rolling the bloom, on the properties of the rails and the production of seams. Taking the country as a whole, a large proportion of the rail failures originate from seams in the base of the rail or from low transverse ductility in the base. This is a rather difficult field to work in and will require a great amount of experimental work, but improvement of rails along the directions mentioned can be expected to materially reduce rail breakages.

The paper on rail mill practice covers a report of a sub-committee that visited the different rail mills of the country. Brief descriptions are given of the several rail plants; representative analyses are presented of the materials used; comparisons are made of each of the stages of manufacture; attention is called to the changes and improvements made in the last few years, and finally a discussion is given of the relation of mill practice to rail failures.

The paper on internal fissures in rails covers a report of a sub-committee concerning particularly the state of information on this subject. The different types of internal fissure are discussed and a bibliography of the subject is given. From the study of a large number of chemical examinations made by the Altoona Laboratory it appeared that transverse fissures occur indiscriminately in the several rails of the ingot and that segregation is not an important factor in causing the fissures.

Mr. Cushing's paper on causes of rail failures presents a large number of illustrations of the different types of failures, gives tabulations and diagram of results of tests and a discussion of the causes of the failures.

The paper by Messrs. Hunt and Gennet gives the results of experience with the inspection of rails by the "nick and break test" of a rail from each ingot, and in which segregation is judged by the appearance of the fracture. It is concluded that this method of inspection insures greater protection to the purchaser of rails and better conserves the interests of the maker of the rails.

The committee submits the following recommendations for the approval of the Association:

1. That the specifications for Quenched Carbon and Quenched Alloy Steel Joint Bars recommended above be adopted by the Association and that they be substituted in the Manual for the present specifications for Heat Treated, Oil Quenched, Steel Joint Bars.
2. That the specifications for Medium Carbon Steel Track Bolts with Nuts recommended above be adopted by the Association.

3. That the specifications for Quenched Carbon and Quenched Alloy Steel Track Bolts with Nuts recommended above be adopted by the Association.

4. That these two specications for track bolts be inserted in the Manual to supersede the Track Bolt Specifications now in the Manual.

Committee: J. A. Atwood (P. & L. E.), chairman; R. Montfort (L. & N.), vice-chairman; E. B. Ashby (L. V.), A. S. Baldwin (I. C.), J. B. Berry (Cons. Engr.), Chas. S. Churchill (N. & W.), W. C. Cushing (P. L. W.), G. M. Davidson (C. & N. W.), Dr. P. H. Dudley (N. Y. C.), C. F. W. Felt (A. T. & S F.), L. C. Fritch (C. N.), A. W. Gibbs (P. R. R.), C. W. Huntington (M. & St. L.), John D. Isaacs (S. P.), Howard G. Kelley (G. T.), C. F. Loweth (C. M. & St. P.), H. B. MacFarland (A. T. & S. F.), C. A. Morse (C. R. I. & P.), J. R. Onderdonk (B. & O.), J. P. Snow (Cons. Engr.), F. S. Stevens (P. & R.), A. W. Thompson (B. & O.), Robert Trimble (P. L. W.), Geo. W. Vaughan (N. Y. C.), M. H. Wickhorst.

Appendix A

Specifications for Quenched Carbon and Quenched Alloy Steel Joint Bars

1. *Access to Works.*—Inspectors representing the purchaser shall have free entry to the works of the manufacturer at all times while the contract is being executed and shall have all reasonable facilities afforded them by the manufacturer to satisfy them that the joint bars have been made in accordance with the terms of the specifications.

2. *Place for Tests.*—All tests and inspection shall be made at the place of manufacture, prior to loading, and shall be so conducted as not to interfere unnecessarily with the operation of the mill.

3. *Rejection at Destination.*—Joint bars which show injurious defects subsequent to their acceptance at the place of manufacture or sale will be rejected and returned to the manufacturer, who must pay the freight charges both ways.

4. *Material.*—Material for joint bars shall be steel made by the open-hearth process or an acceptable alloy steel.

5. *Chemical Properties.*—The chemical composition of each melt of steel from which joint bars are manufactured shall be within the following limits:

Carbon, per cent	0.42 to 0.55
Phosphorus, per cent., maximum	0.04

Note.—In the event of nickel and chromium being present to the extent of 1.00 per cent. and 0.35 per cent., respectively, these elements will be considered as the quivalent of 0.07 per cent. of carbon in the above requirements.

6. The manufacturer shall furnish the inspector a complete report of ladle analysis, showing carbon, manganese, phosphorus and sulphur content of each melt represented in the finished material. The purchaser may make check analysis from the finished material; such analysis shall conform to the requirements of Section 5.

7. *Physical Properties and Tests.*—Joint bars shall conform to the following physical requirements:

	Quenched Steel.	*Alloy Steel.*
(a) Tensile strength, lb. per sq. in., minimum	100,000	110,000
(b) Yield point, lb. sq. in., minimum	70,000	85,000
(c) Elongation, per cent. in 2 in. not less than	1,600,000 Ten. Str.	

Minimum, 12 per cent.

(d) Reduction in area, per cent. not less than 3,500,000 Ten. Str.

Minimum, 25 per cent.

(e) Cold bending of the quenched bar without sign of fracture on the outside of the bent portion through 90 degrees around an arc, the diameter of which is three times the thickness of the test piece.

8. All test pieces shall be cut from finished bars.

(a) The tension test specimens shall be about 4¼ in. long with threaded or unthreaded ends, and with the central 2-in. length turned to a ½-in. diameter, in accordance with the form and dimensions for tension test pieces of the American Society for Testing Materials.

(b) The bend test specimens shall be ½-in. square in section or a rectangular bar ½-in. thick with two parallel faces as rolled.

(c) The yield point to be determined by strain gage.

9. *Quenching.*—(a) Joint bars shall be quenched in oil, or water if so specified, from a temperature of about 810 deg. Centrigrade (1490 deg. Fahrenheit) and shall be kept in the bath until cold enough to be handled. A group thus treated is known as a quenching charge.

(b) Material which requires quenching in water will be acceptable at the option of the purchaser, provided it meets the requirements of the specification in all other respects.

10. *General Requirements.*—Joint bars shall be rolled to dimensions specified in drawing furnished by the purchaser. No variation will be allowed in the dimensions affecting the fit and the fishing spaces of the rail. The maximum camber in either plane shall not exceed 1/32-in. in 24 in.

11. Joint bars shall be sheared to the length prescribed by the purchaser and shall not vary therefrom by more than ⅛-in.

12. (a) All joint bars shall be punched, slotted and shaped at a temperature of not less than 800 deg. Centigrade (1470 deg. Fahrenheit).

(b) All bolt holes shall be punched in one operation without bulging or distorting the section, and the bars shall be slotted when required for spikes in accordance with the purchaser's drawing, the slotting being done in one operation. A variation of 1-32-in. in location of the holes will be allowed.

13. All types of joint bars must be finished smooth and true without swelling over or under the bolt holes, and must be free from flaws, seams, checks or fins. The fishing angles must be fully maintained.

14. *Branding.*—The rolled bar shall be branded or marked for identification in the following manner and a portion of this marking shall appear on each finished joint bar.

(a) A portion of the name of the manufacturer, the year of manufacture, the numbered design and the kind of material shall be rolled in raised letters and figures on the outside of the bars.

(b) The letters "O H" shall be used to indicate open-hearth steel.

(c) The letter "Q" shall be used to show that the joint bars have been "quenched." If the joint bars are also tempered, the letters "QT" shall be used to show that they have been "quenched and tempered."

(d) The number of the melt shall be plainly stenciled on each lot of bars.

15. *Inspection.*—The joint bars from each melt or heat treatment lot shall be piled separately until tested and inspected by the inspector. One joint bar for tension test shall be selected by the inspector for each melt.

or heat treatment lot represented in finished bars. One joint bar for bend test shall be selected by the inspector for each lot of 1,000 bars or less presented or from each heat treatment lot.

SPECIFICATIONS FOR QUENCHED CARBON AND QUENCHED ALLOY STEEL TRACK BOLTS WITH NUTS

1. *Access to Works.*—Inspectors representing the purchaser shall have free entry to the works of the manufacturer at all times while the contract is being executed and shall have all reasonable facilities afforded them by the manufacturer to satisfy them that the bolts and nuts have been made in accordance with the terms of the specifications.

2. *Place for Tests.*—All tests and inspection shall be made at the place of manufacture, prior to loading, and shall be so conducted as not to interfere unnecessarily with the operation of the mill.

3. *Rejection at Destination.*—Bolts and nuts which show injurious defects subsequent to their acceptance at the place of manufacture or sale will be rejected and returned to the manufacturer, who shall pay the freight charges both ways.

4. *Material.*—Material for bolts shall be made by the open-hearth process or an acceptable alloy steel. Material for the nuts shall be soft, untreated steel.

5. *Chemical Properties.*—The chemical composition of each melt of steel from which track bolts are manufactured shall be within the following limit:

Phosphorus, per cent, maximum.....0.04

6. The manufacturer shall furnish the inspector a complete report of ladle analysis showing carbon, manganese, phosphorus and sulphur content of each melt, represented in the finished material. The purchaser may make a check analysis from the finished material; such analysis shall conform to the requirements of Section 5. The drillings for check analysis shall be taken parallel to the axis and from the end of the finished bolt.

7. *Physical Properties and Tests.*—Track bolts shall conform to the following physical requirements:

	Carbon Steel.	Alloy Steel.
(a) Tensile strength, lb. per sq. in., minimum	100,000	110,000
(b) Yield point, lb. per sq. in., minimum	70,000	85,000
(c) Elongation, per cent in 2 in., not less than	1,600,000 / Ten. Str.	
Minimum, 12 per cent.		
(d) Reduction in area, per cent not less than	3,500,000 / Ten. Str.	
Minimum, 25 per cent.		
(e) Cold bending of the unthreaded portion of the finished bolt without fracture on the outside of the bent portion through 90 deg. around an arc, the diameter of which is three times the thickness of the test piece.		

8. All test specimens shall be from the finished bolts.

(a) The tension test specimens shall be about 4¾ in. long with threaded or unthreaded ends, and with the central 2-in. length turned to a ½-in. diameter, in accordance with the form and dimensions for tension test pieces of the American Society for Testing Materials.

(b) The yield point shall be determined by the strain gage.

9. *Quenching.*—(a) Track bolts shall be treated by quenching in oil or water, if so specified, from a temperature of about 810 deg. Centigrade (1490 deg. Fahrenheit) and shall be kept in the bath until cold enough to be handled; a group thus treated being known as a quenching charge.

(b) Material which requires quenching in water will be acceptable at the option of the purchaser, provided it meets the requirements of the specification in all other respects.

10. *General Requirements.*—Track bolts and nuts shall be made to dimensions specified in drawing furnished by the purchaser with allowable variations in dimensions of bolts from standard as follows:

Length, ⅛-in.

Diameter of shank, 1/64-in.

Shoulder, 1/64-in.

Diameter of rolled thread not more than 1/16-in. over the diameter of the body of ⅞-in. bolts.

Diameter of rolled thread not more than 3/32-in. over the diameter of the body of 1-in. bolts.

Variation in dimensions of elliptical shoulders under head of bolt of 1/32-in.

11. The heads and nuts shall be free from checks or burrs of any kind. All finished pieces must be smooth, straight, of uniform size, with well-shaped symmetrical bends and well-filled heads, free from injurious mechanical defects, and be finished in a first-class workmanlike manner. The head shall be concentric with and firmly joined to the bottom of the bolt with the underside of the head at right angles to the body of the bolt. The threads on the bolts shall be rolled, unless otherwise specified, shall be full and clean and shall be made in section and pitch according to the purchaser's standard. The fit between threads on the bolt and nut shall be accurate and nut shall go on with a 10-in. wrench from second to fifth turn. The force to turn the nut completely on the bolt with a 24-inch wrench shall not be more than 60 nor less than 40 lb.

12. (a) The nuts shall be made of soft untreated steel and shall be ¼-in. thicker than the standard nuts used for untreated bolts. They shall be of sufficient strength to develop the ultimate breaking strength of the bolts.

(b) Nuts of standard of thickness will be accepted at the option of the purchaser if proved to be of sufficient strength to equal the ultimate breaking strength of the bolts. The length of the bolts shall be correspondingly reduced.

13. *Branding.*—The heads of the bolts must bear the manufacturer's identification symbol. The letter "Q" shall be used to show that the bolts have been "quenched." If the bolts are also tempered, the letter "QT" shall be used to show that they have been "quenched and tempered."

14. *Marking and Shipping.*—When the bolts are shipped they shall have the nuts applied for at least two threads, and shall be packed in securely hooped kegs of 200 lb. net. All kegs must be plainly marked as to material, size of bolts and name of manufacturer.

15. *Inspection.*—Tension and bend tests shall be made of the test pieces selected by the inspector from each lot of 50 kegs. One piece shall be selected for each test, and if it meets the requirements of the specification, the lot will be accepted. If the test piece fails, two additional pieces shall be tested in the same manner as the one which failed, and if they meet the requirements of the specifications, the lot will be accepted. If, however, either one of the pieces fails, the lot will be rejected. Both tension and bend tests must pass the requirements for acceptance.

Specifications for Medium Carbon Steel Track Bolts with Nuts

1. *Access to Works.*—(Same as for quenched bolts.)
2. *Place for Tests.*—(Same as for quenched bolts.)
3. *Rejection at Destination.*—(Same as for quenched bolts.)
4. *Material.*—Material for bolts shall be steel made by the open-hearth or Bessemer process. Material for nuts shall be of soft steel.
5. *Chemical Properties.*—The chemical composition of each melt of steel from which track bolts are manufactured shall be within the following limits:

Phosphorus, Maximum.	Per Cent.
Bessemer	0.10
Open-hearth	0.05

6. The manufacturer shall furnish the inspector a complete report of ladle analysis showing carbon, manganese, phosphorus and sulphur content of each melt represented in the finished material. The purchaser may make a check analysis from the finished material; such analysis shall conform to the requirements in Section 5. The drillings for check analysis shall be taken parallel to the axis and from the end of the finished bolt.
7. *Physical Properties and Tests.*—Track bolts shall conform to the following physical requirements:

(a) Tensile strength, lb. per sq. in., minimum 55,000

(b) Yield point not less than 50 per cent of the ultimate breaking stress ..... $\frac{1{,}500{,}000}{\text{Ten. Str.}}$

(c) Elongation, per cent in 2 in. not less than

Minimum, 20 per cent.

(d) Reduction in area not less than..... $\frac{2{,}200{,}000}{\text{Ten. Str.}}$

Minimum, 30 per cent.

(e) Cold bending of the unthreaded part of the finished bolt without sign of fracture on the outside of the bent portion, through 180 deg. flat on itself.

8. All test specimens shall be from the finished bolts.

(a) The tension test specimens shall be about 4¼ in. long with threaded or unthreaded ends, and with the central 2-in. length turned to a ½-in. diameter, in accordance with the form and dimensions for tension test pieces of the American Society for Testing Materials.

9. *General Requirements.*—(Same as for quenched bolts.)
10. (Same as for quenched bolts.)
11. The nuts shall be made of soft, untreated steel and shall be of sufficient strength to develop the ultimate breaking strength of the bolts.
12. *Branding.*—Manufacturer's identification shall appear on the head of each bolt.
13. *Marking and Shipping.*—(Same as for quenched bolts.)
14. *Inspection.*—(Same as for quenched bolts.)

Appendix E

American Rail Mill Practice

While the proper sorting and uniformity of the stock of the raw materials exert a favorable influence on the quality of the rails, the big factors that influence quality begin with the making of the steel and particularly the method of recarbonizing and adding manganese and the care used in doing so. Some of the features of the steel making at the several mills are listed in table 7.

It will be noted that at most of the mills the carbon is mostly worked out in making the steel and then brought up to the desired amount by means of pig iron or spiegel (which is an iron high in manganese as well as carbon). Two of the mills "catch the carbon coming down;" that is, the furnace is tapped when the carbon in the bath gets down to the desired amount or slightly below and the deficiency is made up by adding coal or coke to the ladle while tapping the furnace. This method was formerly more extensively used, but it seems that the carbon aimed at in the steel is secured with less certainty. The recarbonizer is added at some mills to the ladle while tapping the furnace and at other mills it is added to the furnace before tapping. The latter method probably is more certain in securing uniform mixture, although there probably is also more loss of silicon by absorption into the slag.

TABLE 7.—ADDITIONS.

Mill	How Recarbonized	How Mn and Si Added	Al added to mold
Algoma.....	C worked to .5. H. Coal added to ladle.....	Cold Fe Mn part to furnace, part to ladle. Cold Fe Si to ladle.....	Experimenting
Bethlehem..	C worked to .1. Liquid iron added to furnace....	Cold Fe Mn, part to furnace, part to ladle. Cold Fe Si to ladle.....	Yes
Cambria....	C worked to .3. Liquid iron added to furnace....	Cold Fe Mn and Fe Si added to ladle.....	Yes
Carnegie....	C worked to .1. Liquid spiegelized iron to furnace adds C Mn and Si.....	Liquid spiegelized iron to furnace.....	Yes
Colorado....	C worked to .1. Liquid iron added to furnace....	Cold spiegel part to furnace, part to ladle.....	Yes
Ill.-Gary....	C worked to .2. Liquid iron added to furnace....	Cold Fe Mn and Fe Si added to ladle.....	No
Lackawanna.	C worked to .2. Liquid spiegelized iron to ladle adds C Mn and Si.....	Liquid spiegelized iron to ladle.....	Yes
Maryland....	C worked to .2. Liquid spiegelized iron to ladle adds C, Mn and Si.....	Liquid spiegelized iron added to ladle.....	Yes
Pennsylvania	C worked to .1. Liquid iron added to ladle.....	Cold Fe Mn and Fe Si added to ladle.....	Yes
Tennessee...	C worked to .5. Coke added to ladle.....	Fe Mn part to furnace, part to ladle. Fe Si mostly to ladle, part to molds.....	Yes

In adding manganese the most general practice is to add it to the ladle as cold 80 per cent ferro-manganese while tapping the furnace, although some of it is sometimes added to the furnace before tapping, using the larger lumps this way to insure thorough melting and mixing with the steel. Some plants add the manganese as liquid spiegelized iron to the ladle while tapping the furnace, which thus adds the carbon, manganese and silicon at the same time. Probably the practice that is most effective in obtaining thorough mixture of all the ingredients before tapping the steel from the ladle is that at the Carnegie rail plant, where liquid spiegelized iron is added to the furnace before tapping into the ladle.

Aluminum is rather generally used as a mold addition in amounts of one to two ounces per ton of steel. Some plants use it regularly and others aim to omit its use when the steel sets quiet in the mold without it. Gary uses no aluminum in rail steel, depending upon sufficient silicon to obtain quiet setting steel. This plant also has a rule not to use ingots with "horny tops" for rails.

Rolling

Some of the features concerning the ingots and blooms are listed in table 8.

It will be noted that most of the mills have two-high reversing rolls with adjustable top roll, thus affording variable draft in blooming. Such rolls have considerable flexibility, but have not, however, a high tonnage capacity, due to the necessity for reversing the direction of the rolls after each pass. Three of the mills divide the blooming among several stands with fixed passes. Observation seems also to indicate a greater tendency to

TABLE 8.—INGOTS AND BLOOMS.

Mill	Size Ingots	Soaking Pits-Capac. Ingots	Blooming Rolls	Blooming Passes	Size Bloom
Algoma	19x23	96	1-2 high revers.	19	8x8
Bethlehem	19x23	175	1-2 high revers.	15	8x8
Cambria-Franklin	20½x23	128	1-2 high revers.	15	9x10
Carnegie	23½x23½	210	2-2 high		
			1-3 high	11	10x10
Colorado	20x22	144	1-2 high revers.	13	8x8
Ill.-Gary	20x24	192	4-2 high	9	7½x8
			1-3 high		
Lackawanna	19x19	168	2-2 high	6	8x8
			1-2 high revers.		
Maryland	21x23	72	1-2 high revers.	15	8x8
Pennsylvania	20x24	64	1-2 high revers.	19	8x8
Tennessee	24x24	144	1-2 high revers.	15	8x8

tearing of the sides of the bloom at these mills, although this is a matter for more critical investigation before definite conclusions are warranted.

Some of the features concerning the rails are listed in table 9.

TABLE 9.—RAILS.

Mill	Reheater Capacity Blooms	Shaping passes	Total Passes	How Sawed	Hot-bed Feet	Straight'ng Presses	Loading
Algoma	48	11	30	Singly	212	5	Skids
Bethlehem	60	11	26	Singly	420	6	Magnets
Cambria	75	12	27			6	Magnets
Carnegie	36	13	24	Twos			Magnets
Colorado	None	10	23	Singly	300	7	Skids
Ill.-Gary	None	9	18	Gang	600	16	Magnets
Lackawanna	None	9	15	Singly	553	13	Magnets
Maryland	None	11	26	Singly	336	8	Magnets
Pennsylvania	48	10	29	Singly	336	8	Magnets
Tennessee	None	9	24	Gang			Magnets

It will be noted that at half the mills the rails are direct-rolled from the heat of the ingot, while at the other mills the blooms are reheated, being given a "wash" heat. The Tennessee plant has a bloom reheating furnace, that can be used for heating up cold blooms when necessary, but is not used in the regular rolling of rails. The Maryland plant has installed a bloom reheating furnace, but it has not yet been put into use. Most of the mills saw the rails singly from the hot bar. This method is, of course, slower than where two or more rails are cut from the bar at one time, but the rails can probably be cut closer to the length aimed at when sawed singly. One very noteworthy feature in rolling rails is the device gotten up and used by the Lackawanna Steel Company for hot-milling the bar, while partly shaped into rail and before finishing. The top of the head and the bottom of the base are milled or scraped, so as to remove most of the surface flaws and seams from the tread and base of the rail.

Changes in Practice

Extensive changes have been made among the rail mills during recent years. The rail plants of the Carnegie and Pennsylvania steel companies have been mostly rebuilt and important changes have been made at some of the other plants. One feature of interest is that there has been considerable improvement in testing equipment and in the amount of investigative work being done by the mills.

At the Algoma Steel Co. a matter of special interest is the nick and break test of a piece of rail from each ingot and the examination of the fracture for both pipe and segregation.

The Bethlehem Steel Co. have made a number of changes largely directed to securing more uniformity in the conditions of manufacture. Large mixers have been installed; in making the steel the practice was to "catch the carbon coming down," while now the metal is recarbonized by means of liquid iron added to the furnace; the practice has been instituted of reheating the blooms.

At the Cambria Steel Co. a feature of special interest is the sinkhead process of casting ingots by which the segregation is obtained close to the top of the ingot and cut off with the ordinary top crop, and which process has been used in some rollings of rail.

The rail mills are making considerable efforts to avoid sending out rails liable to give failures and the statistics of rail failures presented in Report 48 indicate that these efforts are being attended with some success, even though it seems to be true that conditions of service have been growing more severe.

Most of the failures of rails can be divided into three types of failures, as follows:

1. Crushed and split heads.
2. Broken rails and broken bases.
3. Transverse or internal fissures.

The first type of failure, crushed and split heads (vertical longitudinal interior cracks) is mostly the result of segregation, or a concentration of carbon, phosphorus and sulphur in the upper and interior part of the ingot, attended generally with a condition of sponginess in the interior, and a condition of softness in the outer portions of the section, in the upper part of the ingot. The "peaning" or "ironing" action of the rolling wheels causes a side spread of the top part of the head. The outer metal has practically always sufficient ductility to stand this side spread, but if the interior metal has not, it develops a crack, which keeps growing until a split head results. Of course, the more severe the service, the more rapidly does the failure result, but in the absence of defective internal metal the effect of severe service is simply to distort the shape of the rail head, and make bad riding track. It is necessary, therefore, to obtain metal free from excessive segregation. One method of doing this is to discard the top fourth or more of the ingot. This is now the practice of the Carnegie Steel Co. in making all heavy section rails. This method requires that the top part of the ingot be rolled into other material, or that the bloom butts be remelted. Another method is to use the sink-head process of casting ingots, which is being developed in several modifications and which collects most of the segregated material into the top ten per cent of the ingot. This method has been used to a small extent by the Cambria Steel Co. It seems that the general method is a very commendable one, although it also seems to have not yet been developed to a point commercially practicable for the manufacture of rails in large quantities. Our investigations, as well as other work, have shown that ingots that are lively in the mold when setting are attended with considerable interior segregation. Such ingots set with raised or "horny" tops, and as this appearance is evidence of considerable segregation, strong efforts should be made to avoid using ingots with raised tops. The skillful use of silicon, aluminum or titanium makes the ingot set flat and tends to restrain the segregation, but also produces a larger pipe. It may be here remarked that attention is now also being given to more effective means of rejecting segregated rails, by means of analysis, drop test and fracture appearance. Much has been done to avoid making and to eliminate segregated rails and it seems probable that in the course of time the arts of making and inspecting rails will reach a point where failures from split heads will be mostly eliminated.

Broken rails (including square and angular breaks) and broken bases are here classed together, as in general it may be said that they both have their origin in longitudinal seams in the bottom of the base of the rail. A seam not directly under the web, when it opens up, may

result in only breaking out a piece of the flange or a "crescent" break, but if near the middle of the bottom of the base, the opening up of a seam is apt to result in a break through the whole section. The bases of rails are now more generally being made thicker than formerly, and should, it would seem, be stronger against this type of failure, although the main purpose of the thickening was originally to provide more uniform temperature of the rail section when being rolled. More recently the fillet between the web and the base has been increased in some rail sections to afford additional strength against "broken" rails. From the manufacturing standpoint, the Lackawanna Steel Co. has taken vigorous action and devised a deseamer, a machine for milling the surface from the hot bar before fully formed into rail, thereby removing most of the defects from the bottom of the base of the rail. Although it may be said that seams are produced in the rolling, we are not, however, able to state definitely and concisely the factors which govern their formation and we have here a field for extensive investigation. Besides the elimination of seams we have also the problem of increasing the transverse ductility of the bottom of the base, which is generally both low and irregular.

The type of failure known as transverse or internal fissure is one that has become prominent in the last few years with the introduction of open-hearth steel for rails. It usually shows itself as an oval-shaped crack or "simple" transverse fissure inside the head and crosswise of the length of the rail and is also of a bright silvery appearance until exposed to the air. Sometimes, however, the fissure occurs lengthwise and about parallel with the top of the head and about one-half inch down from the top. Generally, also, this latter kind has a transverse fissure running down from it, forming a "compound" internal fissure, or what Dr. P. H. Dudley has named the "coalescent" kind. Although the term "transverse fissure" first came into use, it is evidently only a species (although the most numerous) of a larger group that may be called internal fissure.

As to the cause of this type of failure, we are unable to talk with great confidence and likewise we are still uncertain as to the remedy. The failure seems evidently to be one of detail fracture under the action of repeated stresses, or, more properly, repeated strains. It is sometimes claimed that any normal rail is apt to develop this kind of fracture, but there is a little evidence indicating that the fissure starts from an original internal defect, which keeps growing under repeated alternations of stress, until failure finally results. Of course, any severe strain, as in the gag press, or by defective counterbalance or flat spots on wheels, would much hasten the development of the fissure. Increasing the weight of the rail should, it would seem, strengthen the rail against this type of failure, by reducing the fiber stresses, but this whole matter is one in need of very extensive investigation.

Appendix F

Internal Fissures in Rails

The internal fissure first came prominently to notice in a report made by J. E. Howard on the Manchester, N. Y., wreck on the Lehigh Valley in 1911, and it was in this report that Mr. Howard aptly applied the term "transverse fissure." This failure usually manifests itself as an oval-shaped spot in the interior of the head. These spots occur in all sizes from one-fourth inch or less in diameter to almost the full size of the section of the head. When a fracture occurs through a fissure that has not extended to the surface, the fissure appears bright and polished and we have a "silvery oval spot." When, however, previous to the complete fracture, the internal fissure has reached the surface, the spot will appear dark, due to weathering. One interesting and very constant feature noticeable in transverse fissures is the presence of a "nucleus," a crystalline or granular spot, generally somewhat central, which apparently acted as the center of growth of the fissure.

Although the simple transverse fissure is the more usual form in which the internal fissure shows itself, the fissure sometimes occurs as a compound type, in which a horizontal fissure is joined by one or more transverse fissures. This is the type that Dr. P. H. Dudley has termed the "coalescent" type of interior fissure.

"Internal fissure" is therefore a term that may be applied to a group of failures consisting of two or three species, namely, the simple transverse fissure (which is the most numerous), the compound fissure (showing both horizontal and transverse fissures), and probably also the simple horizontal fissure. In all this discussion it is understood the type of failure known as "split head" or "piped rail" is excluded. Although this failure shows a longitudinal vertical fissure, still the term "split head" has come to be applied to it and it requires separate discussion.

The Altoona Laboratory of the Pennsylvania examined a great many rails that failed due to transverse fissures, the examinations including chemical and physical tests. The age of the rails when broken, it will be noted, lies mostly between two and four years. A great many of the rails show carbon above 0.75 per cent, although probably a great many of them were bought to specifications calling for carbon above the present American Railway Engineering Association limits.

In most of the cases of open-hearth rail the phosphorus is well below 0.04 per cent.

To sum up, this study indicates that transverse fissures occur indiscriminately in the several rails of the ingots and that segregation is not an important factor in causing the fissures.

The Government Bureau of Standards at Washington has been collecting samples of transverse fissure rails and has under way some extensive investigations, including physical, chemical, metallographic, magnetic and alternating stress methods. This work will probably develop some interesting and important information on the subject.

The Carnegie Steel Company has been making some vibratory or alternating stress tests of rails at the Edgar Thomson Works at Braddock, Pa. The machine used consists of a rail straightening press fitted with side arms so that both tension and compression are applied alternately to both the head and base of the rail. At first one machine was used, but the test takes so long that another machine was fitted. It will necessarily take a long time to develop comprehensive results, but useful information may be hoped for from alternating stress tests, and it is a method that should, it would seem, be used extensively in investigations concerning rails.

From our present knowledge, it may be said that the transverse fissure (and perhaps also the other types of internal fissure) is a growth in track from a granular spot or nucleus. The present problem is to determine the origin of the nucleus.

Discussion

J. A. Atwood (chairman): We wish to present the recommendations in a little different form from that in which they are printed. We offer the following amendment:

That the following specifications be received and held under consideration during the coming year with

a view to final action next year: Specifications for Quenched Carbon and Quenched Alloy Steel Joint Bars; specifications for Medium Carbon Steel Track Bolts with Nuts, and specifications for Quenched Carbon and Quenched Alloy Steel Track Bolts with Nuts. We wish to submit this report as a progress report.

M. H. Wickhorst: I have here a summary of rail failures and would call attention to the figures for open-hearth rails. The basis of comparison of performance is the number of failures that have occurred in a period of five years' service. On the basis of rails rolled in 1908, after five years' service, they gave 370 failures per hundred track miles, amounting to something over one per cent. The rail rolled in 1909 gave as a result of five years' service 198 failures per hundred track miles. That would be about two-thirds of one per cent. The rail rolled in 1910 gave 153 failures per hundred track miles, or about one-half of one per cent. The 1912 rail compared with the 1911 and 1910 rail, on a three years' age basis, gave a considerable less proportion of failures. The 1910 rail gave 81 failures; 1911, 83, and 1912, 46, showing a reduction in the number of failures.

Probably the question of most interest at the present time is the question of transverse fissures. The literature on the subject of transverse fissures dates from the time of Mr. Howard's report on the Manchester wreck on the Lehigh Valley, it was in that report that the term transverse fissure was first used. Some definite statements can be made, although the problem is far from being solved. It has been worked out as regards the question of chemistry—we can say, I think definitely—that the transverse fissures are not related to the question of segregation, and they are not related to the matter of ingot position. These transverse fissures occur practically indiscriminately in all rails of the ingot and with rails of perfectly good chemistry, so that we have reached the stage, I think, where these two questions can be eliminated from the problem. The next subject for solution is the question whether the fissures are in any way due to the condition of the physical material. There is very little work which has been done on that, which is sufficiently definite, so that no conclusions whatever can be drawn, but this point has been shown up in the few results available. However, these results are obtained from material that has been in service, and whether the material was originally that way or not, the work so far does not in any way show. The question we are up against now for solution is the physical condition of the material in the interior of the head. If that is perfectly normal, why, then, the problem has been advanced a little further, and we have got to look for service conditons entirely as the cause of the trouble. If, on the other hand, that material is deficient in ductility, then we have got to look for the source of the trouble in that condition.

(The amendments to the specifications were put to vote and adopted.)

REGISTRATION AT A. R. E. A. CONVENTION

Boughner, A. G., Asst. Eng., B. & O. R. R., Baltimore.
Church, H. M., Div. Eng. M. W., B. & O. R. R., Baltimore, Md.
Clift, A. E., Gen. Supt., I. C. R. R., Chicago, Ill.
Correll, E. J., Div. Eng., B. & O. S. W. R. R., Chillicothe, Ohio.
Cunningham, W. J., Prest. Asst., B. & M. R. R., Boston, Mass.
Dick, H. B., Eng. M. W., B. & O. S. W. R. R., Cincinnati, Ohio.
Hatch, H. A., Div. Eng., A. T. & S. F. Ry., Chanute, Kan.
Howard, C. P., Senior Civil Eng., Div. Val., I. C. C., Chicago.
Hughes, W. T., Asst. Div. Eng., B. & O. R. R., Cumberland, Md.
Johnson, J. M., Con. Eng., Ill. Cent. R. R., Louisville, Ky.
Maher, John, Asst. Div. Eng., B. & O. S. W. R. R., Flora, Ill.
Mordecai, Augustus, Consulting Engineer, Cleveland, Ohio.
Raymond, W. G., Dean, Col. Appl. So., State Univ. Iowa, Iowa City, Iowa.
Reinholdt, J. H., Prin. Asst. Eng., M. & St. L. R. R., Minneapolis, Minn.
Rettinghouse, Herman, Ch. Eng., C. St. P. M. & O. Ry., St. Paul, Minn.
Richey, C. W., Master Carpenter, P. R. R., Pittsburgh, Pa.
Ritter, Adam, Arch., Q. & C. Route, Cincinnati, Ohio.
Simons, P. T., Asst. Eng., Mo. Pac. Ry., Little Rock, Ark.
Stimson, F. J., Supt., Penna. Lines, Zanesville, Ohio.
Warden, R. E., Asst. Eng., M. P. Ry., Atchison, Kan.
Wasson, J. H., Recorder. Div. Val., I. C. C., Chicago.
Williams, W. D., Chief Engineer, C. N. R. R., Van Wert, O.

STATEMENT FOR AMERICAN RAILWAY ASSOCIATION WITH REFERENCE TO CONTINUATION OF INVESTIGATION ON RAIL

By Robert Trimble,
President, American Railway Engineering Association.

In October, 1905, the Executive committee of the American Railway Association recommended that a committee of nine persons be appointed as a committee on Standard Rail and Wheel Sections, this committee to include the members of such other technical organizations whose co-operation seemed desirable in securing the best results. A committee was named, with G. L. Peck, chairman, which took up the matter of rail sections and rail specifications, and as a result of its work a report was made to the American Railway Association in March, 1909, recommending that the series of sections of types "A" and "B" of the American Railway Association and specifications for Bessemer and open-hearth steel rails submitted to be adopted as the recommended practice of the Association, and that the sections and specifications be referred to the American Railway Engineering and Maintenance of Way Association, with the request that they follow up the question of determining the details as to drop test, etc., by ascertaining the actual results for rails rolled under the new sections; that they also arrange to collect from the different members and tabulate all information as to comparative wear of rail rolled from different parts of the ingot, and all other information necessary to the proper study of the problem; that they be further requested to keep careful record of the comparative results in service of rails of types "A" and "B" and prepare to submit to the American Railway Association a single type section which will embody their ideas as to the best type that can be designed for use as a single standard to be adopted by the American Railway Association, giving due weight to every factor entering into the problem.

The recommendation of the Executive committee was concurred in and the entire subject of rail sections and specifications was referred to the American Railway Engineering Association. It will readily be seen that the American Railway Engineering Association could not undertake the work contemplated by the American Railway Association without making special provision in the way of providing men whose whole time could be given to the subject, and we find that this question was raised and disposed of as follows:

"The following resolution adopted by the committee on Maintenance (of the American Railway Association) at its meeting in Chicago on November 16, 1909, was presented to the Executive committee at its meeting on the same date:

"*Resolved,* That the committee on Maintenance recom-

mend to the Executive committee that the American Railway Association be requested to make an appropriation of $5,000 per year to defray the expenses incident to conducting the tests of rails to be made by the Rail committee of the American Railway Engineering and Maintenance of Way Association in conjunction with the manufacturers' committee at Steelton and Sparrows Point, using the special machines which are there for that purpose.

"In connection therewith, the Executive committee recommended to the Association the following resolution, which was adopted by the Association at its session on November 17:

"Resolved, That an amount not to exceed $5,000 be placed at the disposal of the committee on Maintenance for the purpose of arranging upon such terms as it may deem best for the tests proposed to be made under the auspices of the Rail committee of the American Railway Engineering and Maintenance of Way Association."

M. H. Wickhorst, who was in the employ of the Chicago, Burlington & Quincy, was engaged in January, 1910, at a salary of $3,000 per year, as engineer or tests for the Rail committee. He was given a leave of absence for a year with the thought that the work of the Rail committee would possibly be temporary. About June, 1911, he received an offer from a manufacturing company, and the question of salary and expense in connection with his investigations, which were being paid for by the American Railway Association, was taken up, and as a result his salary was increased to $5,000 per year, which action was approved, and later the American Railway Association provided the funds to take care of this increase in salary.

The following is a statement of expenditures made on account of the investigation carried on by the Rail committee from 1910 to 1915, inclusive:

Year ending December 31, 1910.....	$ 6,207.57
Year ending December 31, 1911.....	7,979.63
Year ending December 31, 1912.....	7,941.84
Year ending December 31, 1913.....	7,133.15
Year ending December 31, 1914.....	7,175.59
Year ending December 31, 1915.....	6,126.89
Total, 1910 to 1915, inclusive....	$42,564.67

The annual consumption of steel rails used by the railroads in the United States varies from two to three million tons, costing in round numbers sixty to ninety million dollars per year. It seems desirable that someone representing the railroads should be continually investigating this subject on account of the large expenditures, and also because of the agitation from time to time due to accidents from failed rails and from other causes. The manufacturers have their experts on research work and the United States Government is also carrying on considerable work along the same lines, through the Bureau of Standards and others. Therefore, it seems not only desirable, but necessary, that a competent person representing the railroads should be engaged in the same kind of study, with a view to keeping our information on rails up to date.

Since the Rail committee has undertaken the investigation of rails in a systematic way, there has been a better disposition on the part of the manufacturers to co-operate. It is believed that owing to the investigations made under the direction of the Rail committee (the funds for which were provided by the American Railway Association) that there has been a definite improvement in the quality of rails; there is further a feeling on the part of the manufacturers that the situation is being watched, and that information is being collected for the purpose of protecting the railroads in case of question arising as to what is being done by the railroads in the way of securing satisfactory and safe rail.

On account of the large annual expenditure involved in purchasing rails, it seems desirable that this rail investigation work should be continued systematically for some time in the future and that provision for this work should be made by the American Railway Association because of the benefits which will accrue to the railroads, forming that Association, from the investigations; in fact, if the funds for carrying on this work are not provided by the American Railway Association, it will have to cease so far as the American Railway Engineering Association is concerned, as it does not have funds at its disposal for this kind of research. This would be unfortunate, because one of the most important accomplishments of the committee has been the presentation of an organized and united front to the manufacturers, and it is only by such organization and unanimity that reforms can be brought about. While a single railroad, through persistent efforts, especially if it be a large and influential system, does bring about improvements in manufacture, the effort is not always persistent enough to accomplish the purpose; whereas organization and uniformity in their requirements and demands on the part of all of the railroads through committee representation, have a decided advantage and effect in bringing about reforms, through constant study and the publication of data and results. The service requirements for rail steel are so severe that radical improvements in its manufacture are urgently necessary, and the agitation of the past through this organization has caused the manufacturers to make earnest study and revision of their commercial methods for the purpose of meeting these demands. These reforms are now in the making, and more than likely they would be abandoned altogether by the abolition of organized pressure to keep up the studies. It is more than ever necessary at the present time to continue the agitation in regard to the changes in manufacture which may be found desirable, and it is important to the manufacturers themselves to keep up their studies and experiments. The railroad companies' best method for keeping up this agitation is through the Rail committee of the American Railway Engineering Association.

The following is an outline of the investigations that should be carried on:

(1) *Continue Investigation of Causes of Rail Failures*

Our knowledge of causes of different types of failures has been put on a more satisfactory and definite basis than existed prior to 1910, and some of the remedies for improving the situation are in the process of being applied. Much still remains to be done, particularly as to transverse fissures, a type of failure that has recently become prominent, and which is causing concern to the railroads.

(2) *Continue Investigations of Details of Mill Practice*

The work already done along these lines has added to the knowledge of the rail mills, as well as the railroads, and this important feature of the work should be continued.

(3) *Continue Investigation and Development of Methods of Inspection*

The various investigations have been found useful in improving methods of rail inspection, and this work should continue so as to effectively prevent the acceptance of undesirable rails.

(4) *Continue Reports on Rail Mill Practice*

The rail mills are being visited from time to time by M. H. Wickhorst and also by members of the Rail com-

mittee and a comparison of the practices in the different mills is made with the view of ascertaining the practices in the mills showing the best results from their product. These comparisons should be continued in order that the best practices in each detail of rail manufacture be brought out so far as quality of the rail is affected.

(5) *Continue Annual Reports of Rail Failure Statistics*

The statistics are useful in comparing the performance of rails from different mills, and they should be continued in order to stimulate the mills to do better.

It is recommended that the American Railway Association appropriate $10,000 per annum for the next five years for the purpose of carrying on the investigations relating to rail as outlined above, under the direction of the Rail committee of the American Railway Engineering Association, which sum recommended is quite small in comparison with the expenditures for rail.

RESOLUTIONS

At the closing session of the convention yesterday morning the following resolutions were adopted:

Resolved, By the members of the American Railway Engineering Association, in convention assembled, that we place on record our hearty thanks and appreciation to Dr. John A. Brashear, Hon. Rodolphe Lemieux, Arnold W. Brunner and the Rev. Allen A. Stockdale, for their admirable and instructive addresses at the annual dinner on the evening of March 22; to the National Railway Appliances Association for the comprehensive and instructive exhibit of railway appliances; to the technical press for their daily reports of this convention, and for the useful information made available to the members; to the official reporters, Messrs. T. E. Crossman and G. W. Burgoyne, for their accurate and painstaking reports of this convention; to the tellers, Messrs. W. T. Dorrance, W. T. Eaton, A. M. Van Auken, Thos. S. Stevens, W. F. Ogle, C. H. Fake, O. Rickert, for their arduous labors in counting and tabulating the ballots cast for officers; to the committee on arrangements for the highly successful arrangements made for the comfort and entertainment of the members and guests attending this convention.

Resolved, That this Association, in convention assembled, places on record an expression of its appreciation of the able manner in which the retiring president, Robert Trimble, has performed the duties of president during the year, and also for the efficient manner in which he has presided over the deliberations of this convention.

A CORRECTION

In the report of the discussion on the subject of clearances in the daily issue of the Railway Age Gazette for March 23, on page 645, the result of the vote on Mr. Lindsay's motion to adopt a 7-ft. 6-in. side clearance was incorrectly stated. This motion was carried by a vote of 84 to 78.

THE ECONOMY OF MACHINE ADZING AND BORING OF TIES

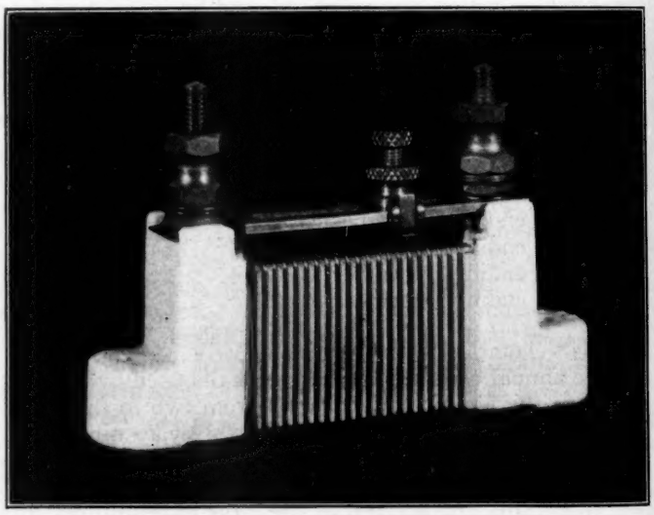
The recent purchase by the St. Louis & San Francisco of two adzing and boring machines from Greenlee Brothers & Co., Rockford, Ill., calls attention to the growth of the practice of the adzing and boring of ties previous to treatment. These machines are in use on no less than eleven other railroads, the Santa Fe alone having five of them. The use of these machines for a period of about five years has demonstrated the advantage of completing all cutting of the ties before submitting them to the preservative process, the fundamental object being to eliminate as far as practical the necessity for cutting into the surface of the lumber after it has been treated. Incidentally the bearings for the rails on the tie are prepared more perfectly and efficiently than can be done by the trackmen with a hand adz. With hand adzing subsequent to treatment there is every opportunity for exposing the timber that has been inadequately treated, thereby very largely defeating the purpose of the preservative process.

With the use of screw spikes the boring of the tie is essential, and should be done preferably before the ties are treated in an operation occurring simultaneously with the process of adzing. Some roads, however, have found it advantageous to bore ties which are to be used with cut spikes by drilling a hole slightly smaller than the spike.

G. R. S. ADJUSTABLE RESISTANCE UNIT

Modern signal practice requires that the flow of current to each track circuit be regulated individually in order that the losses in electrical energy be reduced to a minimum and that the highest efficiency in track circuit operation be obtained.

For this particular purpose, the General Railway Signal Company has designed an adjustable resistance unit. This device, which is of the same length and width as the G. R. S. lightning arrester, comprises a porcelain base 4¾ in. long, 15-16 in. wide and 1⅞ in. high, a number of turns of resistanc wire wound in grooves around the middle part of the base, two R. S. A. binding posts with nuts and washers, a slotted bar which extends from one binding post to a point about one-eighth of an inch from the opposite binding post, and a contacting member consisting of a phosphor-bronze contacting strip, a guide, a tightening screw and a lock nut which can be moved along the slotted bar so as to make the contact with the resistance wire at any one of the several turns. The resistance unit may be mounted in the relay-box, battery-chute or any convenient place.



The G. R. S. Adjustable Resistance Unit

This unit is furnished in one-, two- and four-ohm sizes, with an adjustment of .05 ohm or .1 ohm at a step. The circuit always remains closed when making adjustments in resistance, and it is a simple matter to read the amount of resistance.